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# The New England

# Roadmasters' Association

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## Proceedings,–1890.

RAMAPO IRON WORKS

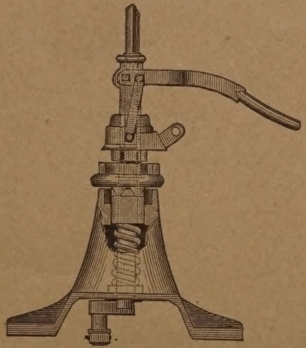
—MANUFACTURERS OF—

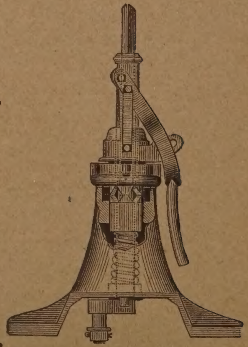
-SAFETY SWITCHES-

—AUTOMATIC—

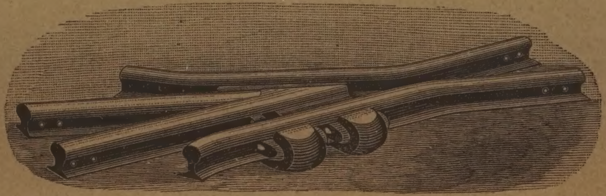
*Safety Switch Stands,*

**Office and Works, HILLBURN, Rockland Co., N. Y.**





FROGS AND CROSSINGS.



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# PROCEEDINGS

OF THE

# Eighth Annual Convention

OF THE

# NEW ENGLAND

# Roadmasters' ✢ Association,

HELD AT THE

AMERICAN HOUSE, BOSTON, MASS.,

August 20th and 21st, 1890.

---

EDITED BY THE SECRETARY.

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NORTHAMPTON, MASS.:
PRESS OF GAZETTE PRINTING CO.
1891.

# OFFICERS.

*President,*

| | | |
|---|---|---|
| W. E. Clark, | V. V. R. R., | Charlestown, Vt. |

*Vice President,*

| | | |
|---|---|---|
| F. C. Clark, | H. R. R., | Falls Village, Conn. |

*Secretary and Treasurer,*

| | | |
|---|---|---|
| G. L. R. French, | B. & M. R. R., | Northampton, Mass. |

*Chaplain,*

| | | |
|---|---|---|
| E. W. Horner, | C. V. R. R., | Rutland, Vt. |

*Executive Committee,*

| | | |
|---|---|---|
| C. B. Lentell, | B. & A. R. R., | Boston, Mass. |
| A. C. Stickney, | B. & M. R. R., | Boston, Mass. |
| E. W. Horner, | C. V. R. R., | Rutland, Vt. |
| F. D. Holbrook, | N.Y.,N.H. & H.R.R., | Stamford, Ct. |

The President. The Vice President.

The Secretary.

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# PROCEEDINGS.

The Convention was called to order at 2.15 P. M., by the President, G. W. Bishop, of the Fitchburg R. R., who requested the members to give their attention to the opening prayer by the Chaplain, J. S. Lane, of the New York, New Haven & Hartford R. R.

PRAYER BY THE CHAPLAIN.— Our Heavenly Father, we would thank Thee this day that so many of us have been spared and are permitted to meet once more in annual convention. When we look back over the year that is passed, we cannot one of us help but realize that Thy hand hath been round about us, and we thank Thee at this time for the many blessings with which Thou hast surrounded us and by which we are at this time surrounded. We thank Thee, our Heavenly Father, that so many of our numbers are permitted to be here, and those of our number who are not here we have no doubt are with us in thought and spirit. As we have now met together not only socially but in a business capacity, wilt Thou, our Heavenly Father, guide us in word and thought, and may the deliberations of this meeting not only do us good who have met here, but may they be a benefit to the railroads which are represented here. Our Heavenly Father, be with us in all that shall be said and done, and if there is a difference in opinion may it be an honest difference and come from the heart, and may we have charity for one another. Wilt Thou give us all boldness of speech to speak our minds, to speak that which we think is right, and so forward the cause for which we have met here this day. We ask it all in Thy Name. Amen.

President — I will now declare the Eighth Annual Meeting of the New England Roadmasters' Association opened for the transaction of business. But before we proceed to business I wish to say that I thank you all, and fully appreciate the honor you conferred upon me one year ago in electing me your president for this year. I accepted that position knowing full well that I should receive the unanimous support of the members of the Association, and it has been fully demonstrated to me during the past year. I was informed last year by my predecessor that the ground of statistics was pretty thoroughly covered, and in looking over it and trying to prepare an address for this occasion I found out that this statement was true. I do not wish to occupy any of the time in that direction. We have questions of importance to discuss here, and I hope that every member will take a part in this discussion. Just what we want and just what we need is the ideas of all, and I shall endeavor to give all an opportunity to speak on these different subjects. The object of this Association is, of course, that we may come together once a year to renew our former acquaintances, form new acquaintances, and discuss these questions which are of so much importance to us as roadmasters. I know that by so doing we are able to perform our duties with more ease, and we have more system with regard to them, and after discussing these questions we go about our work closely observing the remarks that we have heard, and seeing for ourselves whether they are true or not true, and by so doing we attain better results for the railroad companies which we severally represent. I hope that there will be more present later on. I know the difficulties under which we labor in coming here at a fixed time. We can arrange to give a day at a time, one at a time, but to have some fixed date for all is very much to our disadvantage. Something comes up to hinder our coming, and I make all allowances for the light attendance here to-day. You will now give your attention to the reading of the minutes of our last meeting.

The Secretary, pro tem, G. L. R. French, of the Boston & Maine R. R., read the minutes of the last annual convention, and also those of several meetings of the Executive Committee held in the meantime. Herewith is the report on the financial condition of the Association :

### SECRETARY'S VOUCHER, AUG. 1889 TO MAY, 1890.

| | | |
|---|---|---|
| Cash received from assessments, | $64 00 | |
| “ “ “ entrance fees | 22 00 | |
| “ “ “ inventor's exhibit'n fees, | 14 00 | |
| “ “ “ advertisements, | 211 00 | |
| “ “ “ sale of pamphlets, | 47 00 | |
| “ “ “ treasurer, | 83 22 | |
| | | $441 22 |
| Cash paid for hall at Boston, | $ 20 00 | |
| “ “ “ expense reporter and services, | 83 50 | |
| “ “ “ printing pamphlets, | 294 10 | |
| “ “ “ postage, | 10 47 | |
| “ “ “ printing notices, | 1 75 | |
| “ “ “ clerical assistance, | 8 00 | |
| “ “ “ stationery, | 2 00 | |
| “ “ “ express and freight, | 6 40 | |
| “ “ “ packing desk for moving, | 2 50 | |
| “ “ “ six months salary of sec'y, | 12 50 | |
| | | $441 22 |

W. F. Ellis, Secretary.

### SECRETARY PRO TEM'S VOUCHER, MAY 1890 TO AUG. 1890.

| | | |
|---|---|---|
| Cash received from assessments, | $10 00 | |
| “ “ “ advertisements, | 5 00 | |
| “ “ “ sale of pamphlets, | 80 00 | |
| | | $95 00 |
| Cash paid for postage, | $11 25 | |
| “ “ “ printing notices, | 12 50 | |
| “ “ “ stationery, | 1 40 | |
| “ “ “ six months salary sec'y pro tem, | 12 50 | $37 65 |
| Cash to remit to treasurer, | | $57 35 |

G. L. R. French, *Secretary pro tem.*

President—Gentlemen, if you discover any error or omission in the records as read by our secretary you will please state it ; if not I shall and do declare the reports approved. The Treasurer's report will be in order next.

Mr. G. L. R. French, then read the following report of the treasurer :

| | | |
|---|---|---|
| Cash on hand, August 1889, | $275 42 | |
| " paid over to secretary as per voucher, | 83 22 | $192 20 |
| Cash rec. from Sec. pro tem " " | | 57 35 |
| Cash on hand, August 20, 1890, | | $249 55 |

W. F. Ellis, *Treasurer.*

On motion of W. E. Clark, seconded by F. C. Clark, the report was duly accepted.

The roll was then called ; the † before names in the list of members at end of book indicates those present.

The names of persons proposed for membership were then presented and favorably acted upon ; the * before names in list of members indicates the new members.

The Constitution and By-Laws were then read by the Secretary.

President—If our By-Laws are still satisfactory, of course there is nothing more to be said on the subject of By-Laws. The next thing in order will be the reading of communications if our Secretary has any to present at this time.

Mr. French—Quite a number of communications have been received, but they should be read later on, as they are regarding some one of the questions to be discussed.

The officers for the ensuing year were then elected by ballot, resulting in the following choice : President, W. E. Clark, Vermont Valley R. R.; Vice President, F. C. Clark, Housatonic R. R.; Secretary and Treasurer, G. L. R. French, Boston & Maine R. R.; Chaplain, E. W. Horner, Central Vermont R. R.; Executive Committee, C. B. Lentell, Boston & Albany R. R.; F. D. Holbrook, N. Y., N. H. & H. R. R., E. W. Horner, Central Vermont R. R., A. C. Stickney, Boston & Maine R. R., with the President, Vice President, Secretary and Treasurer.

The Secretary then read the following communication from Mr. W. F. Ellis :

Last April I entered the employ of the Dunham Mfg. Co., having resigned as Engineer and Roadmaster on the Providence & Worcester Division of the N. Y. P., & B. R. R., and also resigned as the Secretary of your Association at an Executive Committee Meeting called at that time. At the organization of your Association at Worcester, Mass., in March, 1883, I was elected Secretary, and have held that office for seven years. It has been my intention to do my duty as your Secretary, and as a member to work for the success of the Association by being prepared as far as my abilities allowed, to take part in the discussions, asking and answering questions pertinent to same. In fact, I have been rather too prominent, as your printed pamphlets show, as a Roadmaster and member of the Association. Having the welfare of your Association at heart, I have to-day an unpleasant duty to perform — to resign as an active member of your Association, for these reasons: I have become a supply man, and to remain an active member of your Association, would sow seeds of discord among its members, would have a tendency on the part of your Superior Officers to become hostile to your Association, and a jealous feeling be aroused among other supply men toward myself. During the past years, you have left to my judgment to a great extent, in what manner the supply men should be invited to attend your annual meetings. Believing it was for the roadmasters' benefit as well as the companies they represent, that the supply men should be welcomed to bring to our meetings any appliances of interest to us, that by observation of same and in comparison with others of like kind, we could arrive at a better conclusion whether they could be recommended for even a trial. By hiring a room separate from the room in which we hold our meetings, in which their appliances can be placed for our inspection and shown to us, thus a dividing line being drawn so that in the room where we met for our discussions they were welcomed only as spectators and no devices shown there unless in the discussions they were called for by the members to illustrate arguments. I have advocated in the discussions, the members to express their preferences for any device they have used, and show why they have arrived at their conclusions as regards same being superior to others; and at each meeting let it be known if the superiority claimed previously has failed to show as represented through further trial or improvements in like devices, yet in resolutions passed to use caution in expressing such preferences. The members present at the Third Annual Meeting at Springfield, Mass., will remember there was two excursions on the second day which did interfere with the work we expected to do, but since that meeting the members have attended no excursions or entertainments until the evening of the second day or on third day only, from which custom the printed reports of the last four meetings show an improvement.

The territory of your Association is such that you must not expect at any meeting to have more than forty members present, so that the members who do attend must come prepared to do good work, to show any progress at the meetings. Financially you are sound, as there is in the hands of the Treasurer $249.55; debts all paid, with a desk and other office fixtures for use of Secretary. To have the Association show life, a printed report of the proceedings must be sent out each year. To have such report of value to members, advertisers and friends of the Association, depends how well your reporter is able to get a verbatim report of the words spoken, and his copy of same is boiled down or abridged by the Secretary before being printed. As your Secretary these past years, I have been somewhat impulsive at your meetings, when, sitting by your reporter found I could not hear the words of a member, forgetting sometimes due respect to the chair, called the member's attention to speak louder or come nearer the reporter, also have desired all resolutions and communications from members to be presented in writing, knowing full well there were a good many evenings' work for the Secretary to do on the copy of the reporter before being printed, and not even then to the satisfaction of all. For the benefit of your future Secretary please remember the above. I have prepared a paper on the third question, Frogs and Switches, etc., and on the last question, which if you desire, at the proper time will present to the Association, thanking all both old and new members for the pleasant associations of the past, the knowledge I have gained from being a member of this Association. I trust the same pleasant relations will exist between myself and the members of this Association in future years as there has been in the past, and I know all present believe I desire personally to see future progress and success to the Association and its members.

William F. Ellis, *Ex-Secretary.*

Mr. F. C. Clark—Mr. President, if not out of order, I would like to say a word or two in regard to the letter which was just read by our Secretary, before making two motions.

President—You are in order.

Mr. F. C. Clark—I believe that the reasons assigned by our retiring Secretary are correct and proper. I believe that it is just to him, to ourselves, and to the railroad people whom we represent here, that we formally accept his resignation. Before making that motion, however, I will make another motion, that we tender to Mr. Ellis our regrets at the necessity that takes him from our Association. After action on that motion I will present the other.

The motion was seconded by Mr. J. W. Shanks and carried.

Mr. F. C. Clark—I now move you that we accept the resignation of Mr. W. F. Ellis.

The motion was seconded by Mr. J. W. Shanks and carried.

President—Has any member any business he would like to present at this time, before we proceed to the reports of committees, and the discussions of questions? If not, we will proceed to the reports of the committees.

Mr. Horner—Mr. President, I would suggest this: We have already expressed our regrets, but it seems to me that it would but be just that we have an expression of thanks for the faithfulness and usefulness of our past Secretary in his seven year's service. I think perhaps this would be the best time to make such a motion, and I will make it as a formal motion that we extend to Mr. Ellis the thanks of this Association for his faithfulness and usefulness during these years.

The motion was seconded by Mr. F. C. Clark and carried.

Mr. W. E. Clark—If it is in order, I would move that the chairman of each committee make his report at this time, to be taken up in its regular order.

The motion was seconded by Mr. F. C. Clark and carried.

## REPORTS OF COMMITTEES.

President—The first subject for discussion is, "Best and most economical method of repairs to track in the winter and spring months." The committee appointed to report on this subject are J. W. Shanks, N. L. N., chairman, F. C. Clark, H. R. R., and J. W. McManama, F. R. R. Is the chairman ready to report? If so, we will now receive it.

Mr. J. W. Shanks read the report of the committee, as follows:

Mr. President, and Gentlemen of the N. E. Roadmasters' Association—We, a Committee selected to present a report on the best and most economical method of maintaining track in the winter and spring months realize the difficulty of securing a starting point for the report and the question presents such a varied scope, that we hardly know how to commence. We do see the necessity of formulating some standard, which in our opinion is best adapted to secure the results sought after, providing the conditions of things on the various roads in New England were similar enough to permit of one rule governing the whole.

1st. The best economy in winter is secured by having your road-bed made of the right kind of material to prevent deleterious results from the action of frost, therefore we say be thoroughly prepared for any emergency that winter or spring may present.

2d. We are of the opinion that economy prescribes five miles of single track, and four miles of double track as the outside limit for the length of sections and this length to be proportionately shortened by the amount of yard tracks that are to be cared for.

The number of men required per mile for winter care of track varies so much on account of attending conditions of road-bed and track, that your committee deem it unwise to state a positive number until our road-beds are prepared as suggested by the primary remarks of this report. We are aware that on many of our roads the number is nearly one man per mile, and on other roads only one man for each two miles, but let us look into the matter carefully, and perhaps we shall find that on these roads where one man per mile is allowed, that the men have to work fully as hard as on roads where only about one-half the number are employed, as on some roads the trackmen are required to do so much outside work, that the amount of labor directly chargeable to track work, would have a balance in favor of the latter, to say nothing of the more severe conditions of road-bed, which the latter have to contend with, and whilst there are many small items of labor that can with economy be done by the trackmen, yet as a general rule we are of the opinion that it is not a matter of economy for any road to ask the section men to do all its outside work, or even the greater part of it. It occasions too much lost time, and destroys the ambition of the men and ruins their pride in their section, as these outside jobs frequently call them away from their track, where they are urgently needed. The old adage, "A stitch in time saves nine" is a good one and we believe it is poor economy to divert trackmen from their duty to the track.

In general, then, we believe in the best of preparation in summer, close attention through the winter, and the most complete watchfulness during the spring months, to which we will now devote ourselves for a moment, by saying that we believe the best results for a given amount of money can be obtained by increasing our track force to the highest limit at the opening, getting our poor ties out and new ties into the track before hot weather comes, or in other words, our track re-tied and in good surface by July 1st, at which time a reduction of help can be properly made, and the men thus relieved can find ready work elsewhere at good wages.

All of which is respectfully submitted.

J. W. SHANKS,
J. McMANAMA, *Committee.*
F. C. CLARK,

On motion of Mr. W. E. Clark the report was accepted and laid upon the table for discussion at the proper time.

President—I will now call for the report on the next question, "Inspection of road-bed—daily and yearly inspection; premium system." The committee upon this question are J. R. Patch, Conn. River, chairman, C. B. Lentell, B. & A., and R. P. Collins, O. C. Are the committee present, and the chairman ready to report?

Mr. Patch—Mr. President and gentlemen, your committee have not prepared a very elaborate report. We merely give you our ideas, so that you can start a discussion of this question. I have not met Mr. Lentell until to-day, and I have not seen or heard from Mr. Collins, the other member of the committee, but I will read you what we have drawn up.

Gentlemen—Your committee on daily and yearly inspection of road-bed and track and premium system submit the following report:

1st. Each Section-master should send one reliable man over his entire section every morning, Sundays included, providing there are night or Sunday trains run; also should send a man over his entire section after every storm or hard shower, either day or night.

2d. That all Section-masters should inspect the whole road together once each year.

3d. That there should be a yearly inspection of road by men competent to judge of its condition.

4th. That we believe in offering first and second premiums to the Section-masters who make the best showing for the year, all things being considered.

J. R. Patch,
C. B. Lentell, } *Committee.*
R. P. Collins,

On motion of Mr. F. C. Clark the report was accepted, and laid upon the table to be taken up for discussion later on.

President—Third question, "Experience with frogs and switches now in use, and the greatest cause of their renewal." The committee consist of L. J. Spaulding, F. R. R., chairman, A. C. Stevens, B. & M. and S. B. Bodwell, Jr., B. & M. Is the committee present and ready to report?

Mr. Bodwell—Mr. President and brother Roadmasters, In the absence of Mr. Spaulding I have our report which I will read:

Mr. President and Gentlemen, We a committee appointed to report upon the question, "Experience with Frogs and Switches now in use, and the greatest cause of their renewal," respectfully submit the following:

We suggest that at this meeting the question be discussed and considered in two parts, switches first, frogs second.

The two great classes of switches in general use are the point and stub switches; there are also other kinds having good qualities. The Tyler switch with its castings has had its day; with our heavy locomotives and trains it is not always a safety switch when wrong, though when first put in use it was so considered.

The Cook switch is only an improved Tyler, and with its steel fittings in place of the castings is practically a much safer switch, but this is still the stub switch with its open joint in winter, and tight one in summer, with loose head-block to be tamped every few days.

With a split switch all is changed to a continuous rail and with an automatic stand it is the most perfect switch invented.

No road can afford to use a stub switch in the main line, though very many are used in freight yards, and probably will be for many years to come. There are many causes for repairs to stub switches which do not enter into the care of the point switch ; the latter will last as long as the main track rail, and your committee stand by the vote of the Association at previous meetings regarding the same.

As to the greatest cause for renewal of frogs ; there is no question in the minds of track men but that hollow wheels wear out the frogs badly. On some roads it is the practice to take worn out wheels from under passenger cars and put them under freight cars.

Worn-out wheels kept in service is the chief cause of renewal.

L. J. SPAULDING,
S. B. BODWELL, JR., } *Committee.*

On motion of Mr. W. E. Clark the report was accepted and laid upon the table to be taken up at the proper time for discussion.

President—Fourth question, "Railroad ties ; dimensions, position and number to be laid per mile under 56, 60, 72 and 76 lb. rails." The committee are as follows : A. C. Beane, C. V. R. R., chairman, R. Hyland, Cheshire R. R. and W. E. Clark, V. V. R. R. Are the committee present and ready to report ?

Mr. Hyland—Mr. President, in the absence of the chairman I will report on this question.

The committee to whom the tie question was referred, beg leave to report as follows : standard tie to be nine feet long, seven inches thick, and six inches face or more ; equally spaced with large end under the inside rail on curves, three thousand per mile under all weights of rail.

R. HYLAND,
WM. E. CLARK. } *Committee.*

[Length changed to 8 feet in report adopted after discussion.]

On motion of Mr. J. W. Shanks the report was accepted and laid upon the table for future discussion.

President—Fifth question; "Review of previous years' discussions." Committee, J. S. Lane, chairman, P. A. Eaton, C. & M. R. R., and E. K. Post, N. Y., N. H. & H. R. R.

Mr. J. S. Lane—Mr. President, as chairman of that committee I would like a little further time. I have not been able to see either of the other members of the committee, and knew that there was not time to get it up, and I should like further time to confer with them before making a report, and I will hand it in later in the week. Probably this is something that does not come in until the last of the discussion.

On motion of Mr. W. E. Clark, Mr. Lane was granted further time.

President—I will inquire of our Secretary if there are any further reports to be presented at this time?

Mr. G. L. R. French—There are none.

Mr. W. E. Clark—Mr. President, I move that we proceed to discuss the first question, if it is in order.

Motion duly seconded and carried.

## REPAIRS TO TRACK.

President—"Best and most economical method of repairs to track in the winter and spring months." The question is now open for discussion, and I recommend that we proceed to discuss this voluntarily, so that it will not necessitate my calling upon the members.

Mr. French—Mr. President, I think, inasmuch as it is some time since the report was read, that it would be a good idea to repeat it. (Reads first part of report.) Probably that is enough to start the discussion. The committee say, "by having your road-bed made of the right kind of material to prevent action from frost." Now, what kind of material do you want there, and how much of it, under the ties?

Mr. W. E. Clark—Mr. President, I would give you my practice. Although it may not be good practice, I will state it to show you what we do where I am. It may bring out the practice of some of the others. In the first place, in preparing for winter I think your ditches and water ways should all be thoroughly cleaned. Have the proper amount of shims on hand and arrange for clearance of tracks from snow in stormy weather with the least delay. Culverts should be properly attended to. The upper end of all culverts I think, should be cleaned out thoroughly of debris of all kinds, and on the Sullivan road—I don't know as any of you have this trouble, but all culverts leading to the west freeze up if they are not banked. So we take them from the beginning to the end and bank them up thoroughly, leaving a small place for the water to run, that is, at the outlet of the culvert. On the Valley road which leads to the east we don't have any trouble of that kind. Places that heave badly we dig down and shim in the summer to prevent shimming in the winter, and take those shims out in the winter. In the spring of the year, when the frost is coming out of the ground, we used to have a good deal of trouble from breaking through. I don't know of any way to prevent that except a thick coat of ballast. Where you have not the ballast you have to keep your watchman out in order to find those places and shim them up when you do find them. I don't know as any of you are troubled in that way through the frost getting into the mud. As I understand it, this question does not extend to the spring months, only to the time when the frost comes out. That is my practice during the winter.

Mr. French—The question reads like this: "Method of repairs to track during the winter and spring months." Of course it extends up to the time that you have got your track ready for summer.

Mr. W. E. Clark—Well, proceeding, as soon as the frost commences to come out of the ground I commence to put in ties, just as soon as the frost will allow, getting them in just as soon as possible while the track is rough in the spring of the year. We calculate to get them in and have track surfaced by the first of July, ready for the summer travel.

President—Will some member please follow with this discussion? It would make it all the more interesting if you would all take part in this discussion, and if you all had a word or two or more to say. It would be very pleassing to the chair if you would improve this opportunity and get this business through in the allotted time. I would like to see it thoroughly discussed, not slighted.

Mr. W. E. Clark—Mr. President, I would like to hear from Mr. Hyland.

President—Mr. Clark, we would like to hear from all, and I am afraid the chair will get personal in a short time if it remains as quiet as this. Mr. Hyland is called for.

Mr. Hyland—Mr. President, I have not a great deal to say on that question. I think the best way to get ready for winter is to have the track well ballasted. What I would do in all cases, if I could, would be to put gravel two feet or eighteen inches thick. Then there would be no trouble about breaking through or tracks heaving badly, and it would prevent a great deal of shimming in the winter, and a great deal of breaking through in the spring. I don't know of any other way to do it.

President—I will call upon Mr. Horner to give us his experience.

Mr. Horner—Mr. President, I agree with the report. Perhaps some of you may remember when we did not have gravel and all the facilities necessary for graveling a road so that it would not heave. I am well convinced from my experience that the time and materials spent in shimming are thrown away, and worse than thrown away; because all that you do in that line has got to be undone, you injure your ties, you often injure your rails, and often break your spikes, and do a great deal of damage in trying to do a little good. Of course we are compelled to do it when the track heaves. We have got to get through in some way, and we get through in the best way we can. But it is a very expensive operation, and as far as I am concerned—perhaps others think so—I believe we ought to begin early every spring to prepare for winter, and carry out the recommendations of this report. It seems to me very important, and it would be a good idea, and a valuable suggestion to all railroad corporations that are interested in it, if it could be carried out, to have the track put in shape a good while before winter, so that we need not resort to all these expedients and devices to patch up and get through the winter the best way we can. I should be in favor of ballasting a road. If there were only a few places I would dig it out, but if a large portion of the road required I would raise it all and put on sufficient ballast to prevent any extensive or severe heaving. Then, I think about draining that the more perfectly you drain it the less trouble you will have with heaving. It is not the earth that heaves, it is the water that is in it. If any kind of soil, no matter what it is, is perfectly dry, no water can heave it, no frost can enlarge and expand it. It is the water that is in it that does the mischief. So that the dryer you make it the less heaving there is. A road perfectly drained will get along with less ballast than one that is imperfectly drained. What is suggested in the report before us ought to be carried out and carried out fully. The shape of a road, the rounding of a road-bed, and keeping it well cleared and raised, and banks properly dressed so as to carry off the water into ditches will help much, and it should be done in advance, and should be well attended to. But all this don't amount to anything unless you have a good bed of ballast. If the track gets out of level in the fall it will be out of level in the winter, for our shimming is not caused so much by the heaving, but very largely by the uneven condition of the track in places. In the sections with which I am acquainted we usually have a considerable season of wet, variable weather before it freezes up, and during those long weeks I always wish it would freeze earlier and quicker. During those long weeks of bad weather perhaps it freezes on the surface and thaws after, and the track gets very much out of level, and calls for a great deal of shimming.

President—We should be pleased to hear from Mr. Lane.

Mr. J. S. Lane—Mr. President, I don't know as I can exactly say brother Roadmasters at the present time, still I have been a Roadmaster so long that I have not cut loose entirely from the old associations, and I shall not from this Association at present unless you put me out.

President—We shall not do it.

Mr. J. S. Lane—As to the ballast, you know for some years I have been a stone ballast man, and instead of going back and getting away from stone ballast I have taken up that for my business. I don't want any of you to think that I want to sell you any stone ballast (laughter), but if I were going to continue the rest of my life—for I hope to be spared some years yet—in railroading, I certainly should remain on the old stone ballast track if I could. I have tried that for seven years out of the thirty-three years during which I have been on the track. Last year in our part of New England we had a little frost and probably with most of you but very little heaving, and as there was but little snow, we were enabled to get along with two, or three men at most, on any section of from three miles and a half double track up to four and a half on the Hartford Division of the N. Y., N. H. & H. R. R. That, I think, is a pretty close record to work to. I certainly should not want to take the responsibility of having that number of men on gravel ballast take care of the track with the number of trains and the weight of locomotives which they run there, and consider it safe. We never had a wheel off the track that I know of. I should have once thought I was a fit subject for an insane asylum if I had said I could get along with that force of men, but as I said before, on the stone ballast we had no difficulty, and I think the track rode just as well when I left it the first day of April as it did in the fall, although on some of it the steel rails were pretty well worn out when the stone was put there in 1881 up to 1884. And the same rails are there to-day on that road, which I don't believe could have been kept on a gravel ballast, I don't care how good the gravel was that you put under it. I don't believe any gravel ballast could have been put under our track, with the number of trains and weight of locomotives that we have, that would have carried it as safely as the stone ballast has done. As for drainage, I believe that in stone ballast, as I have said before, it is just as important, and perhaps a little more so, although I don't know as it is any more so. When the stone goes on there should be just as few pockets for the water to stand in as possible, and I believe the same thing should be done on gravel roads. Where track is raised from poor bottom, bad clay or hard pan, such as old roads have, and gravel put under, if a pocket is left there the water is sure to fill that in winter and heave the track if the water gets down through the bed of gravel to that. I have always been a strong advocate of the subway being well graded, so that when the water goes down through the ballast, whether gravel or stone, it would work off, and not collect in a pocket, and freeze and heave the track, which I believe is done many times where you have got a sufficient bed of gravel to keep it from heaving if the water could get out from under the gravel. This was my experience while on the track. As I said, I am not on it now, and may never be again, but I certainly shall not lose my interest in track affairs,—not at present at any rate.

President—I would call upon Mr. Samuel Greer for his experience and ideas.

Mr. Greer—Mr. President and Gentlemen, all there is about taking care of the track in the winter and spring months is simply this : I have had some experience and entirely with gravel ballast. The first and best of all things is good common sense. Don't leave anything undone that you can do. Now, if you have got a piece of track that will heave up, attend to it at once. Get the superintendent to put his hand in his pocket, and say "We will put on a gravel train, and fix that piece." That is the only cure that I know of for a poor, miserable piece of track. Put the gravel on and enough to stop it from heaving. It will make it nice to put in ties, it will be economy, it will stay. But there is no rule that I know of to work by in New

England. Some roads have got in such good order that there is little to be done on them. Now, I have got in my mind a piece of road that I saw this morning coming here to Boston. It is in just about as good order as the hand of man can put it in now, lined, surfaced, everything, If we can get our superintendents and managers to put on some ballast, the track will take care of itself with any kind of care at all.

President—Mr. F. C. Clark has had some experience in shimming, we should like to hear his experience.

Mr. F. C. Clark—Mr. President and Gentlemen, there doesn't seem to be much either in the question or the remarks to provoke discussion. We simply get up here and agree with the primary, and all the way through second the view which the primary in their report took of it. As one of that committee I don't know what more I can say than I said in that, and what has been repeated by every gentleman, I think, on the floor, that best economy is secured by a complete preparation. Now, then, as I view it, and as I have previously stated in our meetings, the benefit that accrues to us as railroad men, and from us handed out to the railroads in New England and all roads that we become connected with, is, that we get the opinions of these men. They agree as touching one thing, that there should be gravel or something—brother Lane says stone ballast, and I agree with him, if you can get it—something that will prevent deleterious results from the action of the frost. We stand together, then, as one man. And the officials, whether it be the superintendent, the general manager, the president, the board of directors, the stockholders, or whoever it may be, have got to combine themselves on every road in New England against this body of intelligence that is before me to-day, and stand up and say we don't know what we are talking about, or else they have got to admit that they are willing to take the chances and keep their money in their pockets. And there is the benefit to us, gentlemen, that when we go away from here, when we ask for a gravel train, or rails, or gravel, or any material that we need in order to make a first-class track, and put it in first-class condition, not only for summer but for winter, that we can point with pride to the records of this assembly, and say, "Gentlemen, I am not alone in this, I am sustained by the unanimous vote of our convention, in which they declare it; and though you may try to defeat it, you have got to take your chances, and be responsible for the consequences, because we are not going to be." Now, then, in regard to gravel or ballast—we will leave it with that term "ballast," because it will cover everything, and then I won't be one-sided or partial. One object that we had in that report was to reduce the length of sections somewhat. On some roads they are increasing the number of trains, and greatly increasing the traffic, and yet they hate to double up the sections, or rather, they hate to spread them out, because it will occasion the hiring of more foremen. Consequently, we have got 6, 6½, 7 and 7½ miles of track for these men to go over perhaps six days in seven, and to get their tools back and forth. And they have a great deal of outside work to do. We want to fix some limit, so that in connection with the gravel we may say that it is the opinion of this body of men that our sections are too long, or that we are doing too much extra work with our section men. Because I never have believed in it, and I have always tried to have the privilege of giving my section men an opportunity to devote their time chiefly—wholly, if you please—to the care of the track, expecting them to take care of that, and holding them responsible for its condition; and if I don't give them an opportunity to devote their time to that, if I don't furnish them with the materials to make first-class track, I am unjust to expect it of them. And if I cannot have it, the way I do is to sit right down and write a letter to the higher officials of the road, saying, "Here, such a piece of track is in such a condition, it requires such an amount of material, it requires such an amount of labor; unless I can have that material and that labor to put that track in proper condition I must be relieved from responsibility regarding that piece of track." And I have always got it. It may be delayed for a time, but we have got to have it. Now, then when we say in that report five miles of single track and four miles of double track, I think the sections are amply long enough. Upon that point, gentlemen, I want your opinion.' I want the question discussed thoroughly. We want to know whether we are right or wrong. We have taken that position, and we will try to maintain it, but we want the ideas of each one of you, and if you with your experience will come up and prove that we are wrong, we will admit it and thank you for it. We want your ideas as to the length of the sections and the number of men required. Now, I frequently talk with railroad people in Massachusetts and Connecticut, and I often inquire, "Well, how many men to a section on such a road do you have? Give me that." Well, then I find out some of those things, and when I look into the matter I find that where they have a piece of track in number one condition it is where they had had an opportunity to put the track in first-class shape, everything is all right, and there is but little, comparatively, to do, and the men have a far easier time than when they have no gravel, a poor track, and are shoveling coal, building fences, digging foundations for engine-houses, or anything that you please, working about half the time there, and they are working a great deal harder, and they have not got any pride in their work, either; and as we state in that report, ten to one they get sent away sometime perhaps, and an accident is the result. And then they come to us, and ask us, "Why didn't you take care of that piece of track yesterday?" I hope that we are all men who have individuality and independence enough, so that if anything of that kind occurs we can stand right up and say, "Simply because the orders were to have the men at such a point at such a time, and we did it, and hence the result," and you have got to bear the consequences.

President—Brother Shanks, will you address the members?

Mr. J. W. Shanks—Mr. President, I don't know that I can say anything different from what has been said. I believe in a thorough preparation by ballasting the road properly, thereby overcoming all difficulties that attend an imperfect road-bed. It not only relieves us of responsibility, but it brings the road into a condition that makes it safe for the traveling public to ride over; and it is my opinion that the traveling community should be considered before any expense in railroad maintenance. I know of no way that that can be reached, except, as I said before, by a thorough and perfect road-bed, by proper ballasting and proper maintenance.

President—Mr. Clark, will you take the chair?

Mr. W. E. Clark takes the chair.

Mr. Bishop—Gentlemen, I would like to say a word on the preparation and condition of the road-bed. I think it is important to us that we in some way convince the managers of railroads that money expended in the ballast and drainage is a good investment, one of the best. Now, on the Fitchburg Railroad they run their passenger trains just as often in the winter as they do in the summer; there is no let up to it, and the track has to be maintained, surfaced and lined as good, if possible, in winter as in summer, and it is a great expense to do this. Now, I consider the first trouble begins in the subgrading of a railroad. There is where the trouble begins. They go through these clay cuts, and mud holes and ledges, and they leave depressions in the subgrade, where in every rain, water accumulates under the track, and when a train passes on to this track up comes the mud through the gravel. It ruins the good ballast that is put in, it loosens the ties and track, and makes it ride bad. Unless ledges are properly excavated, and in such a manner that water will flow out of the ledges, the water will accumulate there in the fall and spring, and the track will heave from the water expanding, as well as from the mud, I remember one experience I had in digging out a bad place in a ledge. I expected to find mud in there. I removed the track on Sunday, cleaned the gravel all out, and there wasn't anything there but gravel, but there was a deep depression there in the rock, and it was water-tight, and there was six or eight inches of water, and that was the cause of all the trouble. But Roadmasters, as a rule, do not prepare the subgrading. They take it with all these imperfections and try to repair it. Now, if companies will only furnish us with gravel trains, and allow us to carry out our ideas, my idea would be, in the first place, to give it a proper drainage, one of the best. Then at the points where the track heaves the worst each year to dig out six or eight or ten of the worst places, take out the clay, and replace it with gravel, and in five or six, or eight or ten years you will see a great improvement in the general condition of your division. I have followed that practice for the last fifteen years, more or less, every year digging out a few of the worst places. It does not cost so very much, and in a very few years your road-bed will be practically smooth. As Mr. Clark has stated, we do call for gravel trains, and we do call for ballast, and we don't get it, and the company has to be responsible. It takes the best material, or should, for shims. It is an expensive operation to saw them out, adze them, take them out on the section, dress off the ties, plug the old holes, put under the shims, make more holes in the ties ; and in the spring of the year you will have uneven divisions, because all divisions have a few good sections, and on these good sections about the middle of April you will see section men putting in ties, while on the section where they have plenty of clay to contend with they don't get to putting in ties for a month afterwards, consequently those sections are behind all through the year. Where the clay is, in the spring of the year you must remove the shims, you must re-gauge your track, you must line it, you must spend two or three weeks in going over the section and getting it up in good surface, so that you can leave it to renew your ties. I wish that the officers of roads might see that it is necessary to expend more yearly in the improvements which I have mentioned.

President pro tem—I would like to hear from Mr. Lentell on this subject.

Mr. Lentell—Mr. President and Gentlemen, I don't know as I have anything to say more than has already been said. I believe that the best foundation under any track in the winter time is good gravel ballast. Two feet of good ballast under the ties, I think will give a good track without much trouble. I think in addition to that the track should be well ditched and drained in the fall of the year, and ordinary winters there would not be much more labor than there would be in the summer time.

President pro tem—Mr. Patch.

Mr. Patch—Mr. President, I don't know as I exactly understand what this question is that you are discussing.

President pro tem—The Secretary will please read the report.

Mr. French—The question is, the best and most economical method of repairs to the track in the winter and spring months.

Mr. Patch—I haven't much to say on that subject. My idea is that we should get our roads in such a condition that there are no repairs to make in the winter and spring months. I think if most of you gentlemen were where I am you could do it, but for some reason or other I don't, because we are not limited as to money at all. Our superintendent says, "John, you are too economical. What business is it to you what this thing costs, so long as the railroad furnishes the money. Now, I want you to go on and do this work. and do it as it ought to be done." We have got a good road, and perhaps there are roads better, but we are improving every year. The main thing is to get our track graveled up and drained so that all we have got to do in the winter is to take care of our snow. I think that is the principal thing.

Mr. F. C. Clark—Mr. President, I want to say one word right here, that I cannot but feel proud of brother Patch, not jealous, that he is so well situated, I wish we all were. But we are not all so. We are many of us in the position of the poor woman who said when a gentleman wanted to stay over night, and wanted to know if she could give him a feather bed. Said she, "I can give you a first-class feather bed, that is, I have got everything except the feathers." We have got everything except the feathers. We have got the right of way, we have got the rails, and the ties, and what the powers above put underneath, and thanks to my predecessor, we have got some gravel, and we are putting on a little more now and then, but we cannot get it all over, we are not so fortunate. It is the expression of just such sentiments as he has expressed that we want here, and we want them to stand upon our records. We want it shown clearly in the items of expense, for I do believe that if they would go to work and issue bonds or borrow money and put on a gravel train and put on ballast enough under their track, the interest on the cost would not be one-half as much as it is to be blocking your track all the time in the winter, and stopping to take out the blocking in the spring, to say nothing of the greater risk that you run. You have to pay a pretty high premium to insurance companies for carrying your risk, but in this case you have to carry your own risk. Therefore we ought to allow something for that. If they will get these items all together it will pay the interest twice over, and that is what we want our people to see.

President pro tem—There are some new members here, some new faces. We should like to hear from them. I cannot call them by name. I should be glad if I knew their names.

Mr. Horner—I don't know whether I am a new member or an old one, I have not been with you for some years. But I want to emphasize this one point that I referred to, and perhaps did not make as plain as I ought. Others have touched upon it also, but I wish it to be made more emphatic. It is this: That every cent paid out, every dollar and every minute spent in shimming track is thrown away, and worse than thrown away a great deal. If they would spend the same amount of money for ballast, it would not be only a temporary relief but a permanent improvement, it would not have to be done over again. Those shims have got to be taken out, to be replaced the next winter and the next winter. Why, I was going to say that I have had to shim some joints for forty-one years in succession. I have come pretty near it. If I did not do it I had somebody to do it. It is thrown away, and not only thrown away, but it is an actual and positive damage to the track, every bit of it, while the same money put into ballast and some permanent improvement would put you on your feet in a little while and make a perfect track.

Mr. J. W. Shanks—Mr. President, I should like to hear from our Secretary on the subject.

President pro tem—Our Secretary is called upon.

Mr. French—I have been very much pleased to have the point emphasized so thoroughly that it is absolutely necessary to have the section men take care of the track, and not be digging foundations for engine houses, as one of our members said. I think that is one great drawback. We in charge of section men, frequently have to place the men on work foreign to that of the track. Well now, if anything should happen after our section men had been away a few days helping on other work, we would undoubtedly be blamed for not having that track properly looked after and taken care of. When you come right to the point we would be to blame for allowing the men to be away on other work. The system is wrong. The track men are employed to take care of the track, and that is the only duty they should be called upon to perform. Another point that I have been glad to see emphasized so well is the fact that shimming is not a paying operation. Whenever you ask to have some improvement made a great many companies will say, is it necessary ? Must we do it to keep the trains running ? For instance, we ask for gravel for two or three miles of road, they will say, is it absolutely necessary ? If you can keep those trains running without it, we cannot pay out the money at present. Well, what are you going to do in that case ? The trains will be kept running, but at the same time although it is not absolutely necessary to go to work and gravel that piece of road, it is necessary later on to pay out money to keep the trains running, and that money that you pay out at that time is money thrown away, while if you had paid it out in the improvement which was not absolutely necessary, it would have been a paying operation. There are several other questions regarding the point of promptness in having the work done, whether it can be delayed or not, economically. Another thing that has not been referred to much is this: Where you cannot get gravel, in order to get rid of shimming in the winter and spring months, what kind of shims, and how long and how thick can be used, and several questions in detail regarding the actual work of shimming should be talked over. We have to do it. We have not the gravel to get along without shimming, and I think we ought to talk over the limits of shimming for safety.

Mr. Greer—I would like to say one word about shimming. Whenever you start a spike in the winter time and that rail is frozen up, and the base is resting right on a solid sheet of ice, that very minute you destroy the safety of the track. You cannot put in anything that will take the place of what should be there, and so I make a motion to not discuss that part of it. It is an expense temporarily for the time, being repeated year after year, and we ought to be doing something better.

Mr. Hyland—I agree with the last speaker that we ought to be doing something better, but as our Secretary says, when the time comes when we cannot do better, what are we going to do? If a man cannot do as he would, he must do as he can. I think that this subject needs a little discussion, and will bear considerable talk, this matter of shimming. It is something that perhaps we all want to have nothing to do with, but we have to do it. As Mr. Horner says, I have been doing it for over forty years, and the same track has got to be shimmed this winter, and I don't know but it will have to be for forty years more; it will unless something else is done to it. There is a good deal in the question about this shimming and what you will do with it, how thick the shims will be, and how you will spike them. I don't agree with Mr. Greer that when we pull the spikes we destroy the safety of the track. I think the track can be shimmed so that it is perfectly safe, and it will be very much safer if it is well shimmed, than if it is not shimmed at all but left very rough. I have seen track that you could not get over, could not run an engine on to, couldn't run a hand car on it, could hardly go over it on foot. In that case you have got to do it. I should like to hear from some of the others about this question.

Mr. F. C. Clark—I want to say just one word. I don't want you to think that I want to do all the talking, I don't want to do anything of the kind. But the question of shimming has been brought up. By the terms of the report shimming would be excluded. I proposed to divide that question. I did not take up those points because I would seem to be a little bit off. If I did I should say that we should not have any shimming. I should say prepare the track so that we would not have to do it. I believe it is proper and wise if we can get good ideas from each other in regard to shimming. There are young men here present who may know more or be sharper than some of these older men, and there may be some points that they want to get. We are not here for our individual selves alone, we are here as a body of men to do each other all the good we can, and therefore a discussion of the question as to the thickness of shims, the length of spikes to be used and the size, that is, the length and breadth of your shims or blocking, I believe would be eminently proper and a very good thing to bring up and talk over. With all deference to the gentleman who proposed to exclude it, when we can get the material as is suggested all the way through that report, why we can put our track in such a condition that it is not going to need any shimming, and then we can throw that subject aside and not discuss it. But now we have got facts to deal with, and the fact remains that where track is imperfectly drained and ballasted it will expand and heave, and as has been well said by my worthy friend from my native State, the water causes it.

President pro tem—I would like to hear from Mr. G. W. Drew.

Mr. Drew—Mr. President, I am a new hand at the business here. In regard to ballast I agree with all who have spoken here, that the right way is to have the road ballasted and get rid of blocking. But when the brother says it don't cost a great deal to dig out the track I cannot agree with him. I have 132 miles of track, about 50 of it on clay which will make good brick. Down in my section of the country we have three feet of ballast. There are places where we have put in four feet. In regard to blocking, we have to block according to circumstances. I consider that it is an endless job to dig out three feet of clay and put in gravel in its place. You can raise the track for half the money that you can dig it out for, if you don't have to draw your gravel more than three or four miles. And speaking about having track-men drawn off I have had section-men drawn off six weeks at a time, not working on the track. I have got some sections where the men don't average more than three days a week on the track, so that the men cannot examine the road very much, although they keep it in fair condition during the summer.

President pro tem--We would like to hear from Mr. Jackman.

Mr. Jackman--Mr. President and Gentlemen of the Association, I can only say that I came down to make no speeches, but to get instruction myself. I am a new man in the Association and out of the Association. I am glad to be here to-day, and have been benefitted by being here this afternoon. I have had some experience on the track, having spent about twenty-two or twenty-three years of my life on it. I have held the position of roadmaster only about a year and a half. But at the same time my experience is worth something. As far as heaving and shimming is concerned, as has been said, there is no way of getting around it. Where the road is not properly ballasted we cannot get along without shimming, we have to do it. Where the track gets sometimes so that the hand car can not go over it, there is no getting round it without shimming. You have got to renew your ties as often as every two years. On some places on the road where I come from we shim and cut too. I would rather take up two rods of track than lay down one. I think with three feet of ballast on an average, which would not cost very considerable, we could run our road with but little expense.

President pro tem — We would like to hear from Mr. Follansbee of the Cheshire Road.

Mr. Follansbee—I think, as all the rest have stated before, that it is gravel that makes a road. If every one could have two feet of gravel I think every one could have good track. Digging out I think is a good plan where there are short places.

President pro tem—I have heard very little said, as yet, on those points that our Secretary brought up about the length and thickness of the shim, and how far it was safe to shim and length of spike that was necessary. We bore everything that is over half an inch thick. Everything that is over an inch and a quarter thick we saw long enough so as to spike it to the ties. Up to an inch and a quarter we put in a seven-eighths spike; for everything less than an inch we use a common spike.

The President resumes the chair.

Mr. Braley — Mr. President, if I could remember I could tell a long story about shimming. On the first day of September I shall have been at it forty-three years. The best way to do is to build the road right in the first place and we would have no trouble about shimming. Seven years ago last year we built a piece of track and I have not had much shimming to do there. The builder was allowed to build it just as he had a mind to. As I told Brother Drew, I have three-quarters of a mile that I built myself right in the winter, and I have not put a shim under it since I built it, there is no need of it. It does not heave, it keeps straight right along. That is the way to have track. It is all drained and filled in. We don't have to shim. When the Old Colony Road was built first, they built it just as cheap as they could, and the engineer that was with me on the New Bedford Road when I was there ten years ago helped to build it. When they came up through Middleboro and came to blue clay he remarked what good ballast that was, how solid it was in the summer when they laid it. And they laid it with joint blocks. There were three blocks under every joint. When the frost set in it hove up, and when they wanted it to go down it did not go down, and those joints stuck up like pyramids and they had to go to work and dig that out, and through cuts dug out blue clay, just as blue as could be, for eighteen inches or two feet deep. The first winter I was not there. They opened in December and I came on in the next September, which will be forty-three years ago the first day of September next. They told me that in some places where the clay was it hove out of line six inches the first winter. Then after a few years I was sent over the Middleboro branch to inspect it and see what there was of it as it had been leased. I went over that branch, and I couldn't think of taking the responsibility of running a train over it. Those blocks went one this way and one that way, up to six inches high. I should not have been foolhardy enough to run a hand car over it in that condition. I suggested gravel, but they said, "Can't you get along without gravel?" I said "Yes." So they didn't give me any gravel. I have sometimes six gangs off by orders, digging foundations for engine houses or something. If there any telegraph poles to set, they telegraph out to me to have my men help with them. The section men must do it, no other men, they think, can do it.

President — We would like to hear from Mr. Stickney on this subject.

Mr. Stickney — Mr. President, I guess I haven't anything to say different from what has been said. We have not heard anything in relation to the length of sections, and I would like to hear this gentleman and the last gentleman who spoke say whether they think five miles of single track or four miles of double track is a sufficient length for a section, from an economical point of view, taking everything into consideration.

Mr. Braley — I think that in ordinary travel five miles is long enough for single track ; that is what they have on our road mostly, where they can conveniently make it so.

I have got some sections where there is not so much travel which are nearly seven miles long. For double track we have three miles, which is long enough where the men have to do extra work outside.

Mr. Drew—Mr. President, it depends upon circumstances whether it is five miles or eight miles, upon how much traffic there is, how many men you can have on your section, where the sections are located, and how much they have to travel back and forth. On some parts of the Old Colony road of late years they have gone in for economy, but where the men have excavating and outside work to do I consider five miles of track enough where the traffic is as heavy as it is on my division, say from six to sixteen trains a day. Brother Braley has got a track where they have more, but he don't have the sand hills, and cuts, and one thing and another, that they do down on the cape. If a company is going to have a section kept running smooth a man to a mile is not sufficient to put in ties, and do all the work, and protect the track.

President—Now, gentlemen, what futher is there to be said on this article? Have you discussed it sufficiently to take some action?

Mr. J. S. Lane—I found that the telegraph system of running extra trains had a great deal to do with what should be the length of sections. I found that that system of running trains on the road that I was on had more to do with it than the number of trains which was running. Formerly a hand car would start out from the car-house, run four miles and a half of double track, go to the end of the section, and be taken off. Within the last three or four years if anything ailed the track, after a car was started you must send a man ahead and, if you obeyed orders strictly, keep a man behind. Now, when you come to carry out that system, and carry out those rules, it has more to do with the number of men required to keep that track in repair, in my experience, than the number of trains which runs over it. In one case we could start and in twenty-five minutes go to the end of our four and a half mile section, and in another case if you got there in an hour you did well, if you had three or four curves to work around. And I don't believe it is generally understood when we bring it up through our railroad superintendents ; I don't think they give us credit for the disadvantages which trackmen have been laboring under for the last three or four years in this respect. That was my experience, and I don't believe it is lessening one particle this year. There was a time when I was Roadmaster on brother Clark's road some fifteen years, that sections for seven or eight years were eleven miles long. I got them down to seven or seven and a half. I think on the road which I left on the first of April they were five miles long, and I got them down to three and a half double track, and I consider that a long section at the present day. With the system they have of running extras by telegraph at the present time, when trackmen must protect themselves at all times, I consider three and a half miles to-day are more than four and a half miles were six years ago. And I believe to-day that on any of our main trunk lines three miles of track is all that there should be in any one section, to allow the section men to go to and from their work safely and economically.

President—Well, gentlemen, the time appears to be passing by. Is there anything more to be said ? We would like to hear a few more remarks before disposing of this article.

Mr. Drew—I agree with the last brother who spoke. Business on our sections has nearly doubled within the last seven or eight years. Engines and cars are doubled, and ties have got to be a great deal thicker, and more ties under the track, and there is required a great deal more labor. A man to a mile is about as low as you can figure upon with the amount of business that is done now-a-days. They are increasing the weight and number of the trains all the time.

Mr. J. W. Shanks — The question that our Secretary wanted to bring up it seems to me has not been answered, that is, in regard to the length and width of shims. We use on the New London Northern road a shim eight inches long and four inches wide, varying in thickness according to the necessities of the case. It strikes me that this is about right thing, and I would like to hear from others what they use. If there is a better size I would like to know it.

President—It is suggested that we assertain the size of shims used on different roads. I guess there is no representative here who does not use shims in the winter time and they should give their dimensions here.

Mr. F. C. Clark — I will state for the instruction of the convention the size of shims we use on the road that I am connected with, the Housatonic. We have our shims gotten out six by eight. We calculate to get them for that size, and just as cheap as we can for that size. Like a man buying oats we get just as much as we can for our money. I think where you have got six inches of surface instead of four it will stand a little longer, providing your tie is level, so that it won't split; but if it does you have still got the timber there underneath. As has been stated by Brother Hyland, I think all our blocking that is one-half inch and upwards should be bored, and when you get above one inch in thickness we use the frost spike. We hardly use anything above two inches in thickness, and I think if I were going to use a block as big as some of the gentleman present use, if it heaved some on both sides I would have an extra set of ties to slip in on both sides, I think it would make it safer.

Mr. W. E. Clark — We use shims four by eight, from about half an inch thick upwards. Brother Clark speaks about putting in an extra set of ties. I think Brother Hyland has seen places where we have done that on the Valley Road, putting one tie right on top of another. It has not been so of late years, but in the winter of 1880 and 1881 we had places where we put in a six inch tie.

Mr. J. W. Shanks — You have graveled some since then.

Mr. W. E. Clark — Yes.

Mr. Hyland — I put in one tie I know, myself, not on the road where I am now, but on the road where I was employed in Vermont, and a great deal of it was shimmed with an inch plank that was laid right across from one side to the other on top of the tie and spiked down, and then another shim on top of that, and as far as safety is concerned I considered that track safe, just as safe as I did before there were any shims put under it, the way it is spiked. I think a track can be shimmed four inches, and be just as safe with the shim under it, if your ties are good enough to spike to.

President—I agree with Mr. Hyland as regards shimming track. I think it can be shimmed to almost any height and have it safe. The question is, can the companies afford to have us doing this work which is so much waste and expense? They cannot afford to do it, if you can make them realize the fact. I consider a track can be shimmed to any height and have it safe, if the company can stand the expense.

Mr. French — Mr. President, why wouldn't it be a good idea to have shimming mentioned in that report, and mentioned unfavorably? Have it pertinent to the report, that the act of shimming is an expensive thing, and ought not to be done, that the money ought to be laid out to prevent shimming in the winter and spring. Why not have our officers realize that shimming is an expensive business? Have it thoroughly understood we denounce it. I think it would be well to have it in the report that shimming ought to be objected to on economical principles, and the expense ought to be directed to prevent the need of it.

Mr. Drew — That is just what I was going to suggest, to give them all the facts about shimming, and there would not be any delays. I think one shim on top of another is perfectly safe, and is better than no shimming. On our track we use braces in winter. I have used four-inch planks and put square timbers right on top of one another. It is safe, but it is expensive. Therefore I think that we had better abandon shimming entirely, and then they will have to run gravel trains or give up running passenger trains.

Mr. F. C. Clark — We shall have to remove the cause or necessity before we abandon shimming. One suggestion at a time, gentlemen if you please. We want something, as I said, in the first place, to take to our officials and say to them that if they want to practice the best economy for their track in winter and spring, we can take care of it easy enough, and we don't ask any advice or any particular assistance beyond what is covered by that report; and the report — while I have no objection to introducing any clause or making any motion that will make it more explicit or definite--that report renders unnecessary the introduction of anything of that kind, from the fact that it says that this economy can be secured only in this one way. When you have reached that point you have removed the necessity entirely. Now, then, if you want something more, and would say that the adoption of this report will render unnecessary all expenses incident to the blocking of track, it will be eminently proper.

Mr. Braley—I think our general manager is well satisfied. He understands all about track, and I think he will be willing to give us what we want. I don't have to ask for much, and Brother Drew can tell you how willing he is to give us gravel trains.

Mr. J. W. Shanks—It seems to me that we have exhausted the subject, and I move that we adopt the report of this committee.

The motion was carried unanimously.

Mr. F. C. Clark—I would like to make a motion now, with reference to that report. I move that the attention of our railroad officials be particularly directed to the discussion of the question, "Best and most economical method of maintaining track during the winter and spring months," as the adoption of the sentiment of the report will remove a large amount of track expense, and increase the safety of our traffic.

The motion was seconded by Mr. French and carried.

President—Gentlemen, do you want to take up another article before tea-time?

Mr. J. W. Shanks—Mr. President, I move that we adjourn until 7 o'clock.

Mr. French—I move as an amendment that we make that adjournment until 7.30. We want to encourage our members to look into the devices out there in the other room, and it would be a good rest to look at them, and talk them over, and come in at 7.30 o'clock for a good evening session.

President—I think it has been our custom to adjourn until half-past seven for the evening session, and have the members as soon as they have come from the dining-room return to the side room, and inspect the devices there ; it is due to those who brought them here, and we ought to do it for our own information. I hope you will come back as soon as convenient after tea is over to the side room, and look over these articles until you understand them thoroughly. There is another thing I wish to mention. Mr. Turner, the chief engineer of the Fitchburg railroad, has extended to the members of this association and their families an excursion from Boston to North Adams and return. A special car, or cars, if necessary, will be attached to a train leaving Boston at 8.30 A. M., August 22d, returning on the train arriving here at 9.40 P. M. I hope my brother members will improve this opportunity to see the Fitchburg railroad. The excursion will be free, and there will be sufficient time to get dinner and see the Hoosac Tunnel lighted.

Mr. W. E. Clark then seconded the motion to adjourn to 7.30 P. M., which was carried.

## NIGHT SESSION.

### INSPECTION OF ROAD-BED.

Meeting called to order at 8 P. M.

President—The next question to be discussed is, "Inspection of road-bed—daily and yearly inspection; premium system." Perhaps it might be well for our Secretary to read the report, it might give you some points.

The Secretary then read the report of the committee. (See page 14 for report).

President—Now, gentlemen, if you will proceed to the discussion of the question, it will save my calling upon you personally. There has got to be something said, you know. I find that I must be personal in this matter, I would like to hear from Mr. Collins.

Mr. Collins—I am not ready to make a speech to-night.

President—We would like your practice and experience in those matters.

Mr. Collins—Please excuse me.

President—Well, let us hear from Mr. Lentell. He has all the systems on his division, I believe.

Mr. Lentell—As I am no speech-maker, I have written off a few ideas, and I will give them to you for what they are worth. I have also copied off an account of our annual inspection, as we do it, and as most of it is done on the Boston & Albany road:

Mr. President and Gentlemen, I find that I am selected as one to speak to you on the best system of track inspection. As I am no speech-maker, it is embarrassing for me to attempt it, but I will try and give you my ideas in as simple a way as possible, and as I have it done on the first division of the Boston & Albany. The first eleven miles of the B. & A. has four tracks, and the sections are two miles in length, the remainder is a double track road, and the sections are four miles in length. The foremen and their men start out to work at 7 A. M. and work ten hours on whatever work they have to do. I have a regular man from each section who starts out afoot at the same time and walks the whole length of the section, taking with him a hammer and wrench ; their instructions are to look sharp for broken rails, loose bolts, etc., and report any defection they may see, to the foreman on their return. This is done every day in the year, Sundays included. You may ask why it is not just as necessary to go over the road at night, or earlier in the morning. For this reason, The first division of the Boston & Albany is mostly seventy-two pound rail, and to my knowledge has not had a broken rail for six or eight months. Trains are run continually all night, and any imperfections would be discovered and reported. So unless I had an inspector to walk the track all the time, (which I think I may be educated up to some time), and he had nothing else to do, I feel perfectly safe with inspection once a day. Now I do not think that once a day is enough on all roads, by any means. I think on some roads where they have light rails, poor road-bed, and bad cuts and fills it should be patrolled oftener, and in the morning before the first train. I will say right here that I believe in cases of heavy winds and rains that men should be out all the time, both night and day, a system which I carry out on my division, on sections where there is any danger from heavy storms. This is about all I have to say in regard to daily inspection.

We have a mechanical inspection, which I would like to speak about. We have what I call a spotter, or low-joint marker ; it is an invention put on the truck of a car and run over the road a number of times a year, and can be set at any gauge, 1-16, $\frac{1}{8}$, $\frac{1}{4}$ of an inch ; now as the car is run over the road fifteen or twenty miles an hour, it will mark the sides of the rails with colored ink; if the machine is set to mark $\frac{1}{4}$ of an inch it will mark all points that are $\frac{1}{4}$ of an inch down; if set to mark $\frac{1}{8}$ it will mark low joints $\frac{1}{8}$ down, and so on. A section foreman will not be governed by this altogether while surfacing his track, but if he sees a blue spot he will know that there is a low place there, even if the rail is up to surface, the sleepers may be loose, and work up and down in the ground, or the rail up from the sleepers, which he could not see while sighting track up at a distance. This is what I call mechanical inspection. Although at first I was one of its greatest enemies, I have now become one of its strong supporters.

The Boston & Albany have a yearly inspection, which may or may not be interesting to you. About the last of September or the first of October of each year, we start out with this inspection of the road. A special car is fitted up with the seats arranged on an elevated platform, so that each seat is a little higher than the one in front, so as to give a good view of the track. The forward part of the car is glass with as little sash as possible, with no door, the glass going nearly to the floor. The car is pushed ahead of the engine at the rate of about fifteen miles per hour. It takes about four days to inspect the road. Our President is very much interested in this inspection, and is not slow to compliment the Roadmasters in any efficient work, and what he does not see while he is on this inspection, would not fill a very large book. Through him a system of prizes has been arranged for the division Roadmasters and section foremen, namely: five prizes to division Roadmasters, and five prizes to each division section foreman. The first prize is offered for the best alignment and surface; the second prize for the best joints and spikes; the third for switches and frogs; fourth, ballast and sleepers; fifth, for ditches and cleanliness. The prizes are determined by marking under each class, from one to ten, which is done by the four division Roadmasters, chief engineer of the road, or his assistant. At the end of each section the car will stop or slow up, and the marking is done for the section just passed, and so on the whole length of the road. After the trip is completed, the different cards with the marking is given to the chief engineer, who figures up the average, and the prizes are awarded accordingly. I will state right here that one man does not know what the others mark. Each is supposed to use his best judgment in marking. I have told you that we mark by sections, and it is by the average of sections on the whole road, that the prizes are awarded to Roadmasters, while the section foremen only compete on their respective divisions ; so you will see there is no chance for favoritism, as the marking of the division Roadmaster does not count for anything on his own division. I have a copy of the card which we use to do our marking on, also a computed sheet showing how the prizes were awarded last year, that I will be glad to show and explain to any one who may wish to see them.

Effect on section foremen. While I think I have a very superior lot of section foremen as awhole, and I do not believe they can be duplicated on any road of its length, yet I think the prize system gives them a greater incentive to do their work in the best possible manner, so that when it comes time for the annual inspection, one section will look as well as his neighbor's, and will try if possible to have it look a little better, so that he will not have the worst section on the road, and perhaps might get a prize. It is possible for one section to take all the prizes. I believe now I have given you our system of track inspection. If any one wishes to ask any questions, I will try and answer them to the best of my ability.

I will state right here, in addition to this, that the section foremen are taken over the road after the prizes are awarded each year the whole length of the road, so it gives each section foreman a chance to see the other sections.

President—Has any member any questions he would like to ask Mr. Lentell, after hearing his article ?

Mr. Horner—I would like to ask the value or amount of the prizes awarded to the section foremen.

Mr. Lentell—I don't know. I will say, at any rate, the smallest prize that is offered on the Boston & Albany would buy a man one or two suits of clothes.

Mr. Jackman—What is taken into account ?

Mr. Lentell—The ratings are here, if you wish to examine them, it will show you how the marking is done. There is some difference in the sections that will have to be considered. The sections are short, four miles in length are the longest.

President—I think the idea that he intended to convey was, whether the condition of the section was taken into account, that is, everything being equal, the amount of extra work, is that considered ?

Mr. Lentell—I take it in the yards the section foremen have more men, and expect to have the track marking as well as another.

President—Is the ballast, drainage, and all those points considered ?

Mr. Lentell—Yes. It shows here on the list, that will show you it. You see there are five chances here on each division for section foremen to take the prizes, there are five different prizes and the section couldn't surely be bad on all of them.

Mr. French—I would like to ask Mr. Lentell if the awards have always been satisfactory. How long has this system been in vogue ?

Mr. Lentell—I cannot say just how long this has been in force.

Mr. French—Does it cause any hard feelings anywhere ?

Mr. Lentell—I think it has been in force ten years, and I never heard any dissatisfaction.

President—Mr. F. C. Clark, we are discussing the question of inspection—daily and yearly inspection, premium system—what are your ideas on the subject ?

Mr. F. C. Clark—I could give you my practice so far as daily and annual inspection are concerned ; so far as the premium part of it is concerned, I have never tried it. My plan in regard to daily inspection is in accordance with the report. I have the track walked every day by some member of my section gang, his own section, not outside of it.

Of course our track, in common with other roads, has an inspection, not only by the railroad commissioners, but also by the officials, usually about four times a year, sometimes oftener than that, but a general inspection ordinarily about that length of time. The premium system I have never tested, and could not speak understandingly upon it. However, I will say that I am favorably impressed with the idea, and think it would be a good thing.

President—Mr. Greer, will you give us your system of inspection ?

Mr. Greer—I don't believe I can add anything to what has already been said.

President—Mr. Horner.

Mr. Horner—I ought to know something about daily inspection. It will very soon now be forty-one years since I was assigned for that duty. My privilege was to walk eight miles before daylight, and that made sixteen miles in all. I tried to do it faithfully. But I have lost faith somewhat in the ordinary way of inspecting track, not the way we expect it to be done, but the way in which it is often done, to say the least. It used to be done in my section of the country with a hand-car. I think those days are past, but I have known it done so. Many times I have known a jigger left on the track, or something of that sort, or a man with a hand-car overtaken before he got around. It is not more than a year since I had a man who was walking the track struck by the train, and he looking right at it. He was not drunk, he was sort of dazed, and thought he was getting off, but he was a clumsy man, and the train was running rapidly, and he did not get his hind leg off quick enough, and the cow-catcher struck his leg and broke it. I have had so many of those things happen. I have known some cases where the men did not go faithfully, would go part of the way, or pretend to go, or something of that sort ; and I have thought sometimes that if we could have our roads in good shape, everything just right, and be sure that it was right when the day ended, and there being six or eight or ten trains during the night, why is it not just as safe for one train as it is for another ?

I don't see any great advantage in putting a man over the road for one train and letting the others take their chances, if there are any chances. I would like, for myself, to have the road just as good as it can be made. everything just as safe as can be, and I wouldn't be afraid to risk it for several trains. I think it ought to be seen once a day or once a night, but I don't know that this recommendation contemplates or enforces the old way of walking the track nights. That has been very common where I belong. It has always been kept up, and is kept up to this time, and if we could be sure that it was done, and was faithfully done in every case, it might afford a little relief, and we might feel a little safer for it for one train, but I don't see that it amounts to much. I think the same amount of money and the same amount of labor, if it could be paid out to strengthen and improve the track, and make it really permanently better, would add much more to the safety of the road, and also more to the safety of the train. That is my feeling about it. I think the track should be inspected at least once a day by the foreman or one of the men. Of course no one would recommend leaving the track to itself. The premium system we have never practiced on our road, but I think it would be proper and well on every road to have a premium system, or to have a grading of help, to have something that amounts to a premium, something that would encourage men to do better, and to make themselves better, better workmen, better track-men, better managers. And I would not be particular, I don't know enough about any system, to say which I would have, but if I could have it to suit myself, I would have one or the other, I would either classify the help, and do better by a good man than a poor man in point of wages, make a difference in the pay, or else I would have a system of premiums. I think there should be a difference. I think our men do not have the incentive to improve themselves, and to do their very best, and to prepare themselves for doing yet better, that would be afforded under this system, or under some system of premiums. As I say it has never been tried with us.

Mr. F. C. Clark—I want to say just one word more, that I don't have my track walked before daylight, except in case of severe storms or winds, or something of that kind. I have it walked at daylight, and intend to have it walked by men who are competent, and who are sober. I think it is a good plan to have the track examined every day by daylight, and have a man walk the track, examining everything in connection with it, fences, bars, cuts, crossings, frogs, switches, culverts, and everything of that kind, so far as he can, and know whether there is anything given out or shows signs of weakness.

President—Mr. Drew, we will hear from you.

Mr. Drew—Mr. President, a good many here are mightier than I, and they should have an opportunity to say something. The first thing I have got to say is in regard to the jigger. I am a great friend of the jigger. I have had jiggers on my road for twenty-five or thirty years, and never had one left on the track. My hand-car weighs about twelve hundred with a load of tools. As far as walking the track is concerned, we don't walk the track, we have velocipedes on our division, and go over it every morning with a velocipede. I wouldn't take the risk of letting a train go over without it. If an engineer feels a little diffident about running; if he knows a man has gone over the road he cannot but feel safer. Although we have never found an obstacle in twenty-five years, I think, still we want it done on every section. On the extreme end of the section we have to do it before daylight, because a train starts about four or half-past three in the morning. The premium system I don't know anything about, but I think it might stimulate men to do better to have something of that kind. I can't get any idea from the Boston & Albany how much for any one section they give them for good work, I don't have any idea about it.

President—Perhaps Mr. Lentell will give you the information.

Mr. Lentell—I don't think I understood the question.

President—Mr. Drew, will you please state your question?

Mr. Drew—I don't seem to understand what any section has made by its good work, how much money.

President—How much premium is awarded for different classes of inspection ?

Mr. Lentell—I have stated that there are five prizes to section foremen, of $50 each, all the same.

President—Mr. Lavoix, can you offer us anything ?

Mr. Lavoix—I have men who walk the track before the first train in the morning. I think that is all that is necessary, to go over it and see that everything is all safe.

President—Mr. Stickney, can you give us your method or idea of what inspection should be ?

Mr. Stickney—I will state, Mr. President, the way that I do on my division of the Boston & Maine road. The foreman or one of his men is supposed to go over the road every day, usually starts out in the morning before the first passenger train. Well, it starts at three or four o'clock in the morning, and it is not always done. But the intention is to go over the road and inspect it thoroughly, either by the foreman or one of his men every day, and it is generally done ; and where the foreman does not get over the road himself every day, he makes a trip at least three times a week ; every other day he calculates, and very rarely omits, to go over his entire section and keep his eye on it. He thinks his own eyes are better than those of his men, and usually finds it so. We have no inspection of the track Sundays. Until a year ago this spring we did, men walked the track before the early Sunday morning trains. About a year ago the management decided that they would allow no Sunday work done unless it was a necessity, and they didn't consider walking the track a necessity. Since then we have had no Sunday inspection of the track. I would like to ask Mr. Lentell a question in regard to this awarding of premiums, and that is, is the Roadmaster allowed to mark on his own division for his own men ?

Mr. Lentell—Mr. President, I think a great deal of what the last gentleman said in regard to each Roadmaster marking on his own division, although I am very glad that it is not taken into account. I think it would have a tendency to cause dissatisfaction among section foremen. One may be a little jealous of the other, and if their own Roadmaster don't mark them surely there won't be any ground for complaint.

President—I would say to the members that when the executive committee met and submitted these questions for discussion, we had one member who was very much interested in this particular article, and I will now call upon our Secretary, Mr. French, to free his mind.

Mr. French—Mr. President, it will take but a minute to free my mind on this question. The first section of this report reads, each section master shall send one reliable man over the entire section every morning. I think, with Mr. Horner, that a man should go over the section sometime during the day, at least once, one responsible man; but I don't see the necessity of putting him over before the morning train any more than before the noon train. I make it a point to have one of my men in each gang go over his section every day. He can go whenever it is most convenient for him to do so. In a great many cases we have a switch light way off at one end of the section that has to be lighted at night, and so on those sections the foreman makes it a point to send his inspector over in time to light the switch light. This second item, that section-masters should inspect the whole road together once each year, I think is a first-rate idea, and I wish that the management of the road I work for would put that practice in vogue, as well as the practice of awarding the most faithful foreman a premium. But we have not got to that yet, we simply have daily inspection and an inspection by the Roadmaster as often as he can get around over his division, and an inspection by the Chief Engineer whenever he finds it convenient to go over the different parts of the system.

President—I will next call upon Mr. Braley.

Mr. Braley—I wish to be excused.

Mr. Horner—I would like to ask a question. I don't know as I understand exactly what is meant in that feature of the report about having all the section foremen on a division or on a road examine all sections together—the section foremen all get together and go over all the sections, is that the idea ?

President—Mr. Lentell will explain that.

Mr. Lentell—The section foremen on the Boston & Albany all go over the road together after the prizes are awarded to the foremen. It gives all an opportunity to see the road, and see what the prizes were awarded for.

Mr. J. W. Shanks—Mr. President, we have no such system as is practiced on the Boston & Albany road, although I believe it is the true way, to give section men something to induce them to do the best they can. I believe it is economy for railroads to do the best they can. I believe it is economy for railroads to do so, I think they get better results from the men, more for the money, and of course better track. As to daily inspection of roads, our system is to send a man over the road every morning, and at any hour in the day or night that there is a heavy rain or wind storm. I don't think it is necessary to run a man over the road during the night, unless there is a storm ; I don't think there is any more danger then than there is in the day time. The reason why I prefer to have the road inspected in the morning is, because as a general thing we have less trains running in the night, especially passenger trains, than we have in the day time, and I think the road should be seen in the morning for the very reason that it makes it safer for passenger traffic to be seen at that time. I think that in the winter season, when the frost is in the ground, and a liability of rails breaking, it should be seen twice a day, as soon in the morning after daylight as practicable, and before dark. That is my idea of making inspection of track, and I would follow that up on the New London Northern road.

President—Gentlemen, I will give you the practice that I follow on my division, and I think it is generally adopted on the Fitchburg system. We have our track inspected twice daily, Sundays not excepted. We have regular track walkers, that is, as far as I am concerned, have regular men to walk the track, and they have from six to ten miles, with stations and conveniences for getting home on trains. They walk ahead of the first train in the morning, and return by train. For that they get half a day. Then in the afternoon, according to the distance they have to walk, the track walker goes out and perhaps works at one end of the section an hour or two or three hours, and then he starts in season to get to the other end of the section, which is located conveniently for getting back on the trains afterwards, and arrives home at five or six o'clock, according to the length of the days. Now, this is followed up every morning and afternoon. We calculate to have the track inspected early in the morning before the first passenger train, and about the last thing before dark. And then in case of heavy rain or cyclones, such as I understand have visited my division since I left, of course we have to get out men and take care of any trouble that may occur. We have embankments that are liable to slide, and we have got that to watch. We don't have any yearly inspection, any further than going over the road with the railroad commissioners. We are all invited to be present, and go with the commissioners and officers of the road. But I warmly approve of the idea of getting Section-masters together and sending them over the road. It is just as much a benefit to them to go over their road and other roads, and see what other men are doing, and how they do their work, as it is for us to come here and discuss those subjects. The premium system I don't know anything about. I always had an idea that it might cause a little jealousy and disturbance, but from what Mr. Lentell says it does not seem to on his line. If it can be done as pleasantly as he represents, I should recommend it, certainly. I don't know as I have anything further to say.

President—Gentlemen, have you discussed this question sufficiently to adopt some resolution? There are a few members present who have not given us their ideas and practice. We would like to hear from Mr. Sibley. We would like to hear what his ideas are as regards inspection of track.

Mr. Sibley—It is about as the rest of these gentlemen have expressed it. I have a man to walk each section every day. The premium system we don't know anything about, never having tried it. I always had an idea that it would cause a great deal of jealousy. It appeared to me that a man having a few frogs and switches would not, perhaps, have an equal chance with a man having a greater number, and there would be more work for the one that had the most to keep them in shape. Perhaps there are a good many points that I don't understand about yet as well as I should.

Mr. Lentell—The foreman on one division that took the prize for frogs and switches last year had as many or more than any other section on the road.

Mr. Sibley—I would like to ask if the number of frogs and switches counts in the award, if the quantity counts or the quality of the work.

Mr. Lentell—It is simply the condition that they are in at the time of inspection, number has nothing to do with it.

Mr. Horner—I am glad that last point was brought out. I have had it in mind for the last ten minutes. There have been a great many difficulties apprehended here in this matter of awarding prizes, and I only speak of it now because I think whether we have that system on our roads or not, we might work on the same basis, on the same principle, that they have to do in awarding prizes. You all know that every foreman shows abundant reason why he should be considered in this matter or any other. Every foreman has sufficient reason why he should have one or two more men than anybody else. He has good reasons why he should have more material than anybody else. He has good reasons why he should be forgiven if his track was not as good as somebody's else. So that if you were going to consider all these things in awarding a prize, you would have to give every one an equal number of prizes, no matter what the condition of his section was. I can't see how you could arrive at a fair conclusion in any other way than the one indicated, and it seems to me that we Roadmasters ought to act on that principle more than we do, and not listen to all these excuses and reasons why work is not done, and why it is not just as it ought to be done, because there is one more switch than somebody else has, or something else. I think we should try to equalize those things as much as possible in the length of section and the application of material, and should expect the track to be kept as nearly equal as possible, and endeavor to have it so. It seems to me that we can act on this basis, although we may not have premiums as an inducement.

President—Mr. Jackman, will you give us your practice?

Mr. Jackman—Mr. President, the practice with us in regard to inspection of track is similar to what has been stated by the rest of the gentlemen. We go over the road the first thing in the morning. As a general thing some one of the section gang will walk the sections. It is almost always the case that trains are delayed and some of the night trains have not gone by. We have a man with a hammer and a wrench inspect the road. In case of severe weather, storms, winds, or anything of that kind, we intend that they shall look at the track during the day. In the night we don't do any inspection, unless in the spring of the year when the track is soft and the frost is coming out, or something of that kind. The premium system I don't know anything about. My idea is that if you take everything into consideration it would be a good thing, but then there would be a good deal to consider, because there is a great difference in sections. On some sections the men are not taken away from a section, but still there are some where they are taken away. A spare gang is made of those men for extra work, building new fences, laying new track, and such things as that, and sometimes if we have much track to re-lay we take them away in the spring. But on some sections they are not taken away at all from their work. If there was a premium offered of course that would have to come in and be considered. As I said, I think the premium system would be a good thing if you are going to take everything into consideration. As far as yearly inspection is concerned, with us we don't have any yearly inspection only by the commissioners and the railroad officials. They will inspect the road perhaps two or three times or probably four times a year, and may be more. The chief engineer goes over the road every two or three months and the superintendent goes over the road nearly every month. The commissioners inspect the road once or twice every year. On my division I intend to get around as often as two or three times a month over the whole division.

Mr. Drew—A word or two in regard to this premium matter. I think myself it is a good thing, perhaps might stimulate section-masters to have better track, but I can't see why the division master should not be a judge on his own division. No other division master knows as much as we do about our own men. Why shouldn't we be better judges in regard to the matter? Once brother Collins used to work for me, and he used to worry continually because I wouldn't give to him men from the main line where there was double the work to be done compared with his work.

President—Mr. Collins has a right to defend himself.

Mr. Collins—In reply to Mr. Drew let me say that I served my apprenticeship under him, started with a tamp-bar on his car. But I don't recollect kicking but once at not having as many men as anybody else, and that was when he gave me one man besides myself on six miles of road, and asked me to build a piece of side track. I thought that was too much. (Laughter.)

Mr. Drew—Oh, I allow him to apologize.

President—Mr. Shanks, out on one end of the Fitchburg, I don't know what he is doing, I would like to hear from him.

Mr. J. L. Shanks—You will have to excuse me, gentlemen. We do just the same as the others who have spoken, walk the track twice a day, and the premium business I don't know anything about.

President—Gentlemen, what disposition will you make of this article?

Mr. French—I offer this resolution regarding the report: Resolved that it is the sense of this convention that the system of inspection as presented by the committee is the best known to-day.

The resolution was duly seconded and adopted.

## FROGS AND SWITCHES.

President—I don't know how late you wish to remain here and discuss these questions to-night. There are three more articles to be discussed before this convention closes, frogs and switches, railroad ties, and review of previous years' discussions. The next article to be taken up is question No. Three. "Experience with frogs and switches now in use, and the greatest cause of their renewal." If you wish to remain here and discuss this question, I am perfectly willing to do so. Act your pleasure in this matter. We will listen to the report of our committee on frogs and switches, which will be read by the secretary.

The secretary reads the report of the committee. [See pp. 14 and 15.]

President—Gentlemen, you have heard the report as read by our secretary, and the subject is now open for discussion. We would like to hear from any and every member.

Mr. French—I will say that Mr. Ellis has a paper to be read on the question of frogs and switches, and it might be best to have that read before the discussion is opened, as it will bring out many points.

Mr. Ellis—Mr. President and Gentlemen, I have made a drawing, which I shall refer to :

## *Experience with Frogs and Switches now in use and the greatest cause of their renewal.*

I claim this question is the most important one to be discussed at this annual meeting and that the Frogs and Switches are the greatest source of anxiety in the care of the track ; that many wrecks, derailments and delays to traffic are caused and much damage to the rolling stock done from frogs defective through loose or improper guard rails and from the switches through poor construction, improper laying or neglect in care.

Thus far from experience and observation I advocate the use of the spring rail frog for main track use except at terminals or through extensive yards and the rigid rail frog elsewhere. I admit the spring rail frog has been condemned in years past and caused some wrecks but believe that those frogs were not made as at the present time. To show the greatest cause of the renewal of frogs and switches I call your attention to a few sketches I have made.

I would class the causes of renewal of frogs and switches as follows : 1st, through sharp flange, hollow tread or improperly gauged wheels passing over or through same. 2nd, through non-care of track men. 3rd, through poor construction when first made or in repairs of same.

Please note sketches of wheel sections showed: Fig. 1 is master car builders' standard for a car wheel : Fig. 2 shows same when worn to a sharp flange and hollow tread ; Fig. 3 shows another form I have seen car wheels worn to ; Fig. 4, an engine driver wheel worn $\frac{3}{8}$ of an inch hollow tread but not as sharp flange as I have noticed in use ; Fig. 5, a blind engine driver wheel worn hollow tread.

There are several patterns of spring rail frogs but I prefer one 15 feet long and built as follows : The spring to be about four feet from point of frog toward toe, a plate thirty-six inches long, eighteen inches wide one end, and twenty-four inches wide the other end, three quarters of an inch thick riveted to the stock and point rails ; three filling castings to be used, especially the one at the point.

A stop to be fastened to the plate about five inches ahead of the one-half inch point of frog, allowing spring rail to move only to a flangeway, not to exceed two inches. From this stop a flat rod should extend about three feet and be attached to spring rail near end, being about five inches distant and parallel to spring rail, and passing through a sleeve attached to the plate about two feet from the stop, for the purpose of holding down the spring rail in place

Fig 1.

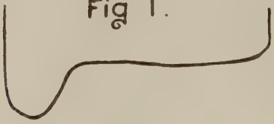


Fig 2.

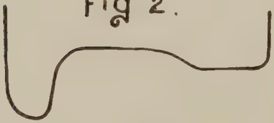


Fig. 3.

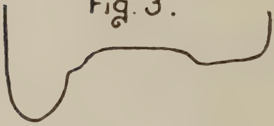


Fig. 4.

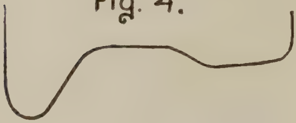
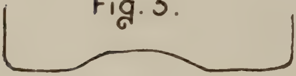


Fig. 5.



and to a level of point rails towards heel of frog; the spring rail to extend about thirty-eight inches from point of frog toward heel, fitting close to same this entire distance; when in use for main track traffic with twenty inches more length added to same, wing curving to a four inch flangeway; the rigid wing to extend longer than usual to properly bolt point rails to same. A spring rail frog thus made properly put in and taken care of should be safe and economical in maintenance.

Formerly the spring rail did not extend back from point of frog towards heel only about twenty inches, allowing a hollow or double flange wheel as figures 2, 3, 4 and 5 show, when trailing through frog to strike the ball of spring rail forcing same out beyond a two inch flangeway, no stops being used, dropping off the point of the frog or breaking same and making wrecks.

The greatest wear to a spring rail frog as now made is on the point or heel rail side track side, where the outside edge of tread of poor and good wheels strike same, owing to the other point or heel rail having cut more depth into the tie; this wear can be helped by trackmens' adze and gauge. The guard rails to same as well as the ties under a spring rail frog should be maintained in a proper condition to give it its proper life.

The greatest wear to a rigid rail frog fifteen feet long is for a distanee of about eighteen inches, six inches ahead and twelve inches back of the point caused by insufficient support to the wheel, so that good as well as poor wheels drop into the depression on wing, making increased wear as well as an uncomfortable jolt, which can be remedied by the renewal of one wing before the rest of the frog, yet this wing should be renewed before the point of frog is worn down too low.

Another cause of renewal of frogs is their imperfect line when first put in, or if properly put in at first, allowed to remain knocked out of line through use of poor ties under same, poor guard rails or by improperly gauged car wheels passing through same. For a remedy I would have specifications attached to every order of frogs to be used on inspection when received, and also at repair shop when frogs are repaired so that not only the line would be correct but length, spread at heel and toe, etc., would be similar on each number of frog. Has not every Roadmaster present had frogs of different makers, or after repairs on same being made, would not interchange with those in use of the same angle requiring a respiking of his lead to the side track thus loss of labor and damage to ties? This Association in 1884 and the Master Car Builders' Association in 1888 adopted a 1¾ inch flangeway at guard rails and frogs. Roadmasters' Association of America the flangeway is 1¾ inches to 2 inches, yet for gauge of 4 feet- 8½ inches, as in use in New England, the custom is 1¾ inches flangeway. The Master Car Builders' Association in 1888, under 'Code of Rules for Interchange of Cars,' rules "Cars may be refused if their wheels measure less than 4 feet, 5 in., or more than 4 feet, 5¾ in. between backs of flanges," thus allowing for no discrepancies in the gauge of guard rails, while the wheels have ¾ in. variation. I will state that there are cars allowed to pass through your frogs with wheels at less and more gauge than above rule calls for. The remedy to be applied I am at a loss what to suggest on the part of the trackman to do, as now it is only in his power to watch the unnecessary wear of his frogs and switches, the turning over of his guard rails, helping the abused parts of same as much as he can spare labor and material so to do and keep his track safe, yet it would pay the road department to have the cost of turning down of some of the poor engine wheels charged to his department instead of to the department the charges belong rather than stand the damage done by them. I advocate the use of rigid rail frogs of shorter length than 15 ft., as their life is so short all extra length not required to fish same properly to connecting rails is false economy, and the flangeway at the throat to be 2¼ in. In the split switch the most wear is from 4th, or rear switch rod, back 1½ or 2 feet. For my views of a good split switch see specifications page 72 of 6th annual report, though would have plates under all the rails on every tie to joint and two braces ahead of point on kinked rail side.

William F. Ellis.

## SPECIFICATIONS FOR FROGS.

The rail to be used is as per Blue Print sent you.

Rail..................................................60 lbs. per yard.

Height......in. Head......in. Web......in. Base......in. (1 in. holes.)

Drilling for Angle Bars. End of rail to first hole center......in., to second hole center......in.

| | Length of frog over all. | Vertex point to heel. | Vertex point to toe. | Vertex point to ½ in. point. | Spread at heel (gauge). | Spread at toe (gauge). | Width of flange way at wing. | Width of flange way at Throat. |
|---|---|---|---|---|---|---|---|---|
| ....1 to 6........Frogs. | | | | | | | | |
| ....1 to 7........ " | | | | | | | | |
| ....1 to 8........ " | | | | | | | | |
| ....1 to 9........ " | | | | | | | | |

REMARKS.—Frogs will not be accepted if not in line when received, and note ½ in. point is called for, etc.,...........................................

..........................................................................

....................................Eng'r or R. M.

President—The question is under discussion yet. I hope somebody will follow Mr. Ellis, without being called upon. We have members here to-night who have had large experience with frogs and switches. If they would give us their opinions we would like it.

Mr. J. W. Shanks—Mr. President, it strikes me that it is getting rather late to get many ideas on switches and frogs to-night. It is nearly half past nine now, and as I have always been one of that kind of men who keep good hours, I move you that we adjourn until nine o'clock to-morrow.

The motion was seconded by Mr. French and carried.

## MORNING SESSION.

Thursday, August 21, 1890.

The meeting was called to order at 9 o'clock by the President.

President—Gentlemen, last night we just entered upon the question of frogs and switches, and one or two spoke on this subject. We will now proceed to a further discussion of that article.

At the request of the President, Mr. W. E. Clark takes the chair.

Mr. Ellis—Mr. Chairman: At last night's session I read a short paper on the frog question, in which,—for the benefit of some of the members who were not present then—I stated or advanced some views which are stated somewhat also in the report of the committee, which were, that the greatest wear to frogs and switches was caused either by badly gauged wheels, or wheels of sharp flanges, or hollow tread. In the paper that I read I called the attention of the members to certain parts of especially the frogs that were worn the most, causing their renewal from the use of such. Of course it is not in our power as Roadmasters to take and apply the remedy, though I did suggest in a certain way that some of the causes could be removed somewhat by the trackman, believing that in railroad work all departments should work together, as a dollar saved in one department goes into the balance sheet of profit and loss account, which at the end of the year if there is a surplus the road department will get a share of that surplus. In this question of the use of bad wheels I believe it is in the power of the Roadmaster somewhat to exact from master mechanic that such wheels be taken care of before they do the mischief that they do. It can be done in a courteous way. On my road that I have just left whenever I noticed on an engine hollow tread wheels, I would write to the master mechanic suggesting that such an engine be looked after and taken into the shops. I even would write a second time. I had the dates of those letters in my copybook. If in a reasonable time the engine was not taken to the shops, which was generally done, there would be a letter go to the superintendent's office referring to the dates of the letters that I had written, and asking that those wheels be attended to. Generally our superintendents are with us when they realize the damage that is being done to our frogs and switches by those bad wheels. Of course the master mechanic is going to let those wheels run, as a general thing, rather too long for our interest as he may be so situated that there is other work in the shops that require attention before he can take these engines in. In some cases he would take those engines off the main line and put them into yards for use, which is the worst thing that he can do, because I believe the frogs and switches there are not attended to as well as in the main track, there are more of them in the yard, consequently the damage may be done to them more. I do believe this question is one in which without any intention on your part of hurting the feelings of the master mechanic, you should handle that department without gloves, or fear, or favor.

President pro tem—Will some gentleman express himself on this subject ?—Mr. Patch.

Mr. Patch—I don't know as I can say anything on that subject.

Mr. Ellis—Mr. Chairman, I would like to ask the gentleman you have last called upon a few questions. Some roads have condemned the use of the spring rail frog through wrecks from the same. I think this gentleman has had a great deal of experience in that direction, and I stated last night what I, individually, supposed was the cause of those wrecks happening. It was from the spring rail not extending back far enough towards the heel of the frog, through the spring rail having no stop to prevent same from going beyond the proper flangeway, and through that spring rail not being held down to a level with the point rails, so that a bad gauged wheel running through could throw it out, and might make a bad wreck, which has condemned the frog in the past. My experience has been limited somewhat to spring rail frogs in use on the road I have just left only for about five years.

Mr. Patch—Mr. Chairman and gentlemen, I presume that I have had as much experience with the spring rail frog as almost any one here. We commenced to put them in in 1871, and we are supplied right through on the main line, main track, with spring rail frogs. In the more than nineteen years that we have had the spring rail frogs in the track I never yet have had a wheel on the ground caused by the frog. The first frog that was made of those for the first eight or ten years there was nothing to prevent the wing rail from pressing out too far, so as to let the wheel drop inside of the rail if anything should happen, the spring should break, or anything of that kind. I went to work and had a cast iron block made, and I spiked it down just the distance from the wing rail that the opening should be for a stiff rail frog, so as to prevent the rail from going out more than one inch and three-quarters from the point of the frog. All frogs that are made for us now have on a stop made with the frog, so that they open only such a distance. I have got four spring rail frogs in the track —or I will state that a little differently. I had four spring rail frogs in the track when I left home, and I suppose they are there now, that were put in in 1872, on the main line, where we are running sixty-two trains a day, which are very fair frogs yet.

Mr. Ellis—Mr. Chairman, one more question I would like to ask Mr. Patch, as he has stated the spring rail frog is very economical for use, and, as his experience showed, on his road has been safe. I would like to inquire where is the greatest wear that causes their renewal, or the parts that, as shown by us, do wear out the quickest? Is it through poor wheels or through the fault of the trackman? I will state for the benefit of the gentlemen who, I think, were not here last night, that I claimed there was a point on the heel rail on the side track where the outside edge of a bad wheel struck.

Mr. Patch—No doubt there is a good deal of trouble with frogs and switches—I will mention switches with the frogs—that we are to blame for. The better frogs and switches can be taken care of the longer they will last. I don't see why those frogs that I speak of, the four in the track, or that were in the track the day before yesterday, are not as good as the rails each side of the frog, or as the rail opposite the frog. Of course if there is a great amount of travel passing through on the turn-out track there is a liability, if you have a lot of wheels that are worn down badly, where there is a double flange, that it will wear down the rail opposite the wing rail, and make a low place.

President pro tem—One moment—that is, the stiff rail in the frog?

Mr. Patch—The stiff rail in the frog, the rail opposite the wing rail, but no more than it wears down a stiff rail frog. There it wears down on both sides, both wings wear, but with a spring rail frog the wing rail does not wear, but it does wear some on the opposite rail from the wing rail where there is a good deal of travel going over the turn-out tracks.

Mr. Eliis—Mr. Chairman, I would like to ask one question more. I don't want to go for Mr. Patch, but it was through his testimony at one of your meetings that I was first led to try the spring rail frog years ago. I would like to ask where he had those spring rail frogs in use, how long, in his judgment, a rigid rail frog would have lasted, that is, the number of years, on the same terms, while if he knows of anything against the spring rail frog I would like to have him state it on the floor.

Mr. Patch—All I can judge by is where we have rigid rail frogs with about the same amount of traffic over them.

In my opinion a rigid rail frog would not run over three years at the most where these frogs have been running nineteen years. I claim that there is a saving of three hundred per cent. in using the spring rail frogs in your main track. I think that the figures on our road will show that.

President pro tem—I would like to hear from Mr. Greer on this question.

Mr. Greer—Mr. Chairman, I think it is in good hands now, with Mr. Patch and Mr. Ellis. I would like to hear from them again.

President pro tem—I think Mr. Greer knows something about frogs ; I have that impression.

Mr. Greer—I cannot state what those gentlemen can, and there is Mr. Clark, Mr. Shanks, Mr. Hyland and Mr. Bishop.

Mr. Horner—While all those gentlemen are getting ready I would like to ask a question or two, for this reason, that I don't know anything about spring rail frogs or point switches. I have only one of each, never had but one of each, and don't know that I shall ever have less. They don't seem to wear out. But I would like to know from Mr. Patch, or any gentleman who has had a long experience, whether you get the same advantage from making these point switches and spring rail frogs from a light, say 56 pound rail, whether it is equally safe and equally profitable and advantageous, as it is in making them while using heavier rail. I have an idea that these loose rails, if very light, would be more liable to spring out of place by worn wheels, or more likely to break from strain, so I have not felt quite as safe or quite as ready to adopt them on my road with a light as I should with a heavier rail. That is the question I would like to hear something about.

Mr. Patch—Mr. Chairman, if I were so situated I would use the spring rail frog just the same. I think that they are perfectly safe to run with a 40-pound rail, especially as they run a 100-ton engine over a 40-pound rail. But the frogs that I am now speaking of, that have been in the track nineteen years, were made out of 56-pound rails.

Mr. Horner—Have they had any repairs?

Mr. Patch—They have not had any repairs since they were put in, not the frogs.

President pro tem—As I understand it, your experience has been mostly with 56-pound rails.

Mr. Patch—My experience almost altogether has been with 56-pound rails. It was only four years ago, I think, that we changed our rail, first from 56 to 66, and then from 66 to 72 two years ago, so almost all my experience has been with frogs and switches made from 56-pound rail.

Mr. J. W. Shanks—Mr. President, on the New London Northern road we have no rails heavier than 60 pounds to the yard. We have the 56, 58 and 60. Our road is equipped on nearly all of the main line with spring rail frogs made from those rails. We have had several of the spring rails break, I think three during the last ten years that we have had them in use. But no accident occurred from them, from the fact that we had the spring rail fastened or spiked in such a way that it could not go out further than the distance of a rigid frog. So that I think that if they do break there is very little danger of their getting out of shape so as to thow a train from the track. I have had no difficulty with them so far.

Mr. Bishop—Mr. President, this frog and switch question is a subject that will stand a great deal of discussion. It means a great deal. We have used spring rail frogs and point switches made of 60, 72 and 76-pound rail. In speaking about the life of a rigid rail frog and spring rail frog in the main line, I will just note one experience that I remember. About seven years ago last fall I had an order to put in a frog and switch. I should have had a left handed spring rail, but I didn't have one in stock, and I took a right, consequently it made a rigid rail on the main line and a spring rail on the side track. I threw the wing out about an inch and a half, and it ran through the winter, and ran perhaps five months. When I took that frog out in the spring, having one to replace it, it was so badly battered on the rigid side that it was not fit for any further use. And the frog that I replaced it with is there to-day, and shows but very little wear. It has convinced me that it is an improvement of three hundred per cent, as brother Patch remarked.

President pro tem—How long has it been in now—about six years?

Mr. Bishop—Well, it has been almost five years and six months. I think we get a great deal better results from the 76-pound rail than we do from the 60, there is not that trembling motion about it when a train goes over. I think there is a great benefit in having a heavy rail to make your frogs and switches out of. As to the cause of renewal of frogs and switches, I think the condition of the wheels and these loads that they run over them is the greatest cause. But there is a good deal of neglect on frogs and switches by our section foremen. They like to get out onto the main track, where trains run faster, and around stations. It is my experience that every little while I have to set apart a day and have them go in the yards among the frogs and switches, and put the yard in order. If I have a piece of roadbed where it is muddy, I make it a practice as far as I can to remove all the poor material around the ties, and if necessary have a foreman take a push car and run four or five miles and get good material for the frog. I think it is a great saving. I don't know of anywhere where we can do more to help save than right there. That is one thing I recommend, getting good material around frogs and switches, even if it takes a little push car work to bring this about. I don't know as I will consume any more time, although there is a great deal to be said on the subject.

The President resumes the chair.

Mr. Patch—Brother Bishop says that he thinks he gets a great deal better results with a heavy rail for spring rail frogs and switches, than he does with light. I think we get better results for our main track with a heavy rail than with a light one.

President—I agree with you thoroughly. I think Mr. Horner asked the question if there were more satisfactory results—I think there are.

Mr. W. E. Clark—We have quite an important subject in this frog and switch question. I want, before proceeding to argue this question, to ask both Mr. Patch and Mr. Ellis this question: Is the spring rail frog under all circumstances, and in all places, absolutely as safe as the stiff rail frog?

Mr. Patch I will answer that in my opinion, for myself, it is just as safe as the rigid rail frog.

Mr. Ellis—Mr. Chairman, I shall have to coincide with Mr. Patch, so far as my experience has been, as the present spring rail frogs are now made. As they were formerly made, I will not say so. And now that I am on the floor, as the switch question has come up, and sometimes we don't like to get up so many times on the floor, although I never used to be one of that kind—on the switch question last night I only referred to the wear at the fourth or heel rod where the edge of the wheel struck the stock rail through the fault of the trackman to a certain extent; that the outer part of the tread of wheels, good and bad, will strike that heel rail on the side track, which was because the point rail near 4th rod cuts into the tie more. There are other facts connected with the split switch which may lead to its being condemned somewhat, through as I claim, construction of same. I have described briefly in those specifications in one of our previous pamphlets, to which I call your attention, a way in the planing of the switch to somewhat obviate what might damage the switch. All Roadmasters do not agree with me, but I would state personally I believe the point of that switch should be planed so that it will fit tight to the rail and one-half inch below the top of the head of the stock rail, chamfered off from a point six inches back, and also that it should be chamfered off from the line of the track one-half inch at the point, starting at a distance eighteen inches back. The reasons that I give for same are these: There are automatic stands that do keep the point up to the stock rail, and yet we, as trackmen, know that for various reasons the gauge at the point sometimes is not the gauge adapted to the switch put in; consequently there is an opening between the point rail and the rail, and in moist snow storms I have seen the trainmen try to shift cars, especially freight trains, with that point sticking out from the rail, so there was a chance of the wheel striking the point of the switch. Now, by chamfering off that point half an inch out of the line you do obviate somewhat those wheels striking that point of switch, or going other side of the point, when from the negligence of the trackman, or for some other reason, the point is away from the rail and may save a wreck or damage to the switch by the breaking of the point. I have noticed that a good many roads do use slides of such a thickness under the point rail. so as to bring their point rail above the stock rail, which, as I judged, was for the purpose of saving wear on the stock rail, but they put all the load then, as I claim, on the point rail, which I do not believe in. Now, in connection with the split switch I would like to hear some of these points brought up.

Mr. W. E. Clark—I think that wheels are liable to be broken in passing over a rigid rail frog in a way which cannot happen on a spring rail frog. I see by the Railroad Gazette that the Pennsylvania road has condemned the spring rail frog, and it is very strange to me that after twenty years' use they have just found out that that frog is not safe. I don't understand it. They have the credit of having the smartest and most enlightened railroad men in the country, that is their reputation, and to take twenty years to find out that that frog is not safe for the main line looks very peculiar to me.

Mr. F. C. Clark—It is possible, Mr. President, that after thirty years we will find it out, and possibly not. I am not here to criticize the spring rail frog. My experience with it when it was first made was not satisfactory, not in the least; and from my own observation, and from conversation with other railroad men, I find there are a good many men who object to the spring rail frog, and declare that it carries with it an element of danger, but they use it and advise its use for the sake of economy. That economy that carries danger with it is very poor economy. Now, then, if the spring rail frog, as now made, and properly cared for, is just as safe in every particular, and under all circumstances, it is certainly advisable for us to adopt it, and certainly advisable for us to use it. But we want to be sure. We all know, doubtless, in our experience with railroads and in railroad work, we have all been obliged to change our opinion in regard to certain things at certain times. We may change ours. Some of us may change to the spring rail, and some who are now its strongest advocates may change from it, we cannot tell. But, to go back a little further, in looking at some of the statements that were made in regard to the causes of frog renewals, pressing it back by the driving wheels of the engine, or any other wheels not in proper condition that are under your rolling stock, we find something that I presume we have all had to contend with to a greater or less extent. We know that the superintendents of our motive power all over the country are a class of men who like to protect themselves the same as we would protect ourselves, and in case of an accident you will find the report goes in over the wire, got off on the frog at such a station, left the track on the switch at such a point. In ninety-nine cases out of a hundred where that has been the case, unless the frog or switch had broken and we are enabled to find a definite cause, the fault is directly traceable to the rolling stock. Now, then, we remove in part the necessity for the spring rail frog when we remove the condition of those wheels. That being the fact, if you can find one single element of danger in the spring rail frog let us go back to the beginning and get our rolling stock all right, and keep our track all right. The results from the use of spring rail frogs—which, by the way, I do not for a moment question, as presented to us by Mr. Patch—are something worthy of consideration. Without the best care those spring rail frogs would hardly have stood the test. I took out last season two stiff frogs from the track in comparatively good condition, but in changing the location, we had a three way switch and I wanted to shorten it. I took them out and put in a shorter frog. They were a number ten frog. Those frogs, I think, had been in the track fifteen years, and they were in good condition when removed. So far as this one point is concerned, of as great safety with the 56-pound rail for your spring rail frogs as with 70 or more, I cannot quite accept it, from the fact that from your spring rail you take up just as much metal to attach your spring, ordinarily, as you do from the heavier rail; consequently your proportion of strength there, is just so much less, and leaves you an element of weakness. In part it may be overcome. Close attention may avoid any deleterious results or any injury, but still the fact remains that you have got a less proportion there to sustain the weight that is passing over it with every train than you have with the heavier rail. Therefore, I say, I believe we can get better results from the heavier rail, which is admitted by Mr. Patch, while we all acknowledge, I think, that by it you get a larger proportion of strength and safety than you do from frogs made from 56-pound rail.

Mr. Ellis—Mr. Chairman, I would like to ask the last gentleman a few questions. I like to criticize. I know that I owe a little of any success that I have had as a railroad man to my intercourse here with the Roadmasters, and by asking questions I gain knowledge. In stiff rail frogs that he has had in use fifteen years I would like him to state what the traffic was over them, also, makers. I would like to know the style or name of that frog. I never on the road that I have been employed on knew a frog to wear as long as that, because it would become weak opposite the point, so that I had to take it out in the fall and put it on a side track and wear it there a little longer than I would risk it out on the main track during the winter.

Mr. F. C. Clark—I will answer the question as far as I can. The maker's name was not on those frogs. I found them in the road when I went there, and we have had over those frogs for the last few years about fifteen trains a day, not quite that the first year, but for the last few years, and prior to that time there were from 24 to 40, I think. They were in our main track. I think, however, but I am not positive, that they were made at the railroad shop.

Mr. Ellis—Were they riveted to a plate?

Mr. F. C. Clark—They were.

Mr. J. W. Shanks—Mr. President, from Mr. Clark's remarks I drew the conclusion that he did not consider there was any danger existing in a stiff rail frog, that he was trying to seek an element of danger in the spring rail frog. Now, I would like to have him state to this convention if he thinks there is a frog or a switch in existence that has not some element of danger it.

Mr. F. C. Clark—I will say no, emphatically, I don't know. It may be that I stated there was no element of danger in the stiff rail frog; I left that point, I think, to be brought out by you or somebody else. I said, if you can find an element of danger in the spring rail frog that you do not find in the stiff frog, and we find that the causes of renewals are from our faulty construction of car wheels or locomotive wheels, then the economy that was secured from the spring rail frog was purchased at the expense of safety. I said that, I did not say that it was a fact, but "if."

Mr. Ellis—He stated that he found such elements of danger in spring rail frogs that we had in use formerly, so that he condemned the use of them. I would like to have him state how they were made, and where those elements of danger were, for I am seeking to know the reason why the spring rail frog is condemned.

Mr. F. C. Clark—They were made by the Pennsylvania Steel Company, and were thirty feet long. The most serious trouble that we had with them was overcome by an attachment similar to what Mr. Patch has presented, that is by fastening a brace just back of the point; and the way

I did it was to open my spring rail one and three-quarter inches and securing the brace therefrom, so that if anything got in between the point and the spring rail if it crowded down or worked on the point as they were formerly made, when there was so much friction there the spring would not spring it back in position, you had then the elements of a stiff rail frog, excepting that it was not a rigid frog, but rigid temporarily. Sometimes those rails would break, and the point I would make is simply this ; That you cannot have any vibrating or spring rail in the track that is subject to concussions by a wheel striking it, allowing it to go back and forth, without its carrying with it an element of danger, I don't believe it is possible.

Mr. Ellis—Mr. Chairman, one question more : Where the spring rail is broken through accident at about opposite the point, by using a plate underneath the point riveted to it and to the stock rail on the rigid rail side, with a casting at the point extending beyond the point towards the throat, say five inches, this break occurring back of the point, if it does occur, now as it is held in the position of the spring rail by the rod I mentioned last night, is not that element of additional danger that he speaks of somewhat overcome?

Mr. F. C. Clark—I shall have to answer that question by saying, yes, that it is more conducive to the spring rail frog's safety. Your first question as to where it broke—sometimes it is close to the point, and at other times back where the bolt went through that fastened the spring. So far as the plates and rivets are concerned, if you get in plates and rivets enough to make a rigid frog of it I think it is safer.

President—Mr. Stickney, we would like to hear your opinion as regards spring rail frogs and switches—any frog or switch, I won't confine you to spring rail.

Mr. Stickney—I will say that on the Boston & Maine road, which I represent, I have now in the track about 70 spring rail frogs, made from 60 to 72-pound rail, the majority of them 60-pound rail. I have just removed 10 that have been four years in the track, I find, from my experience, that the benefit of a spring rail frog over a rigid frog is very great, the exact figures I could not give. But the element of danger exists in a spring rail frog, it exists in everything that is used on a railroad, the element of danger is never removed. If you have a car moved on a railroad there is some danger of its getting off the track and creating disturbance. The best spring rail frog that I have seen was illustrated by Mr. Ellis in his paper read last night. I have used them similar to that. I have eight of them in the track, and I consider them the best spring rail frogs made. They were made by the Pennsylvania Company, with the exception of the plate and stop that he speaks of riveted on a plate. I have received this spring ten Pennsylvania Company's frogs which they have adopted as an improvement, placing the spring at the back end of the spring rail. I have not put them in the track yet, and I cannot say whether I really like the idea or not. It seems to me that the spring will have so much pressure that it will wear the metal faster than the spring placed in the old place, whether it will be so I cannot say. As far as my experience goes with a spring rail frog, I am very well pleased with it. I never have had an accident that was caused by a spring rail frog in any way, shape or manner. The most of the wear that I have had on frogs has been caused by bad wheels, as Mr. Ellis suggests, guttering the side track rail at the heel of the frog, and I have had a good many of those guttered quite badly on my division. We have had a good many engines that have run with a half inch gutter in the tires. I have had one frog that I put in where there was quite as much travel on one side as on the other; I put it in because I had to, that was all I had, and I let it run. I find that that wears as badly as a stiff rail would in that place, that is, I mean on the stiff rail side, the side opposite the spring rail. Opposite the point I find that that has been badly guttered. It has been in now three years and a half, and it is getting pretty near in a condition to take it out. Where a frog is to be used as much on one side of the point as on the other, I should not advocate the spring rail frog, but I should advocate the stiff frog. The expense is less, there is less wear on a stiff rail frog than on a spring rail, they are not so long, and there is less material to go to waste; but where the majority of the traffic will be done on the main track side I shall continue to use the spring rail frog until I see something further about it to condemn it.

Mr. F. C. Clark—Mr. President, we don't belong to that class that make a distinction without a difference, but I would like to ask the last gentleman if he considers the spring rail frog absolutely as safe under all circumstances as the rigid frog. Is there an element of danger in the spring rail frog, in other words, that you don't find in the rigid frog?

Mr. Stickney—Mr. President, while I am a firm believer in the spring rail frog, I shall have to admit that I consider there is an element of danger in the spring rail frog which does not exist in the rigid frog, while there may be other elements of danger in a rigid frog that do not exist in a spring rail frog. I consider that the difference between the elements of danger that exist in the two frogs is largely in favor of the spring rail frog, that is, I mean in the use of them. The chief element of danger, as I regard it, in a stiff rail frog is allowing the wing rail to be badly battered and shifted out, and make the danger of breaking a wheel which we do not begin to get credit for. I think there are a good many wheels broken right there. The wheel don't usually give out right at the frog, it may run half a dozen miles before it gives out. Then it is a broken wheel, and that is all there is about it, whereas it should have been attributed to a bad frog caused by bad wheels largely. I think that from my experience with spring rail frogs I give them the preference over rigid frogs, where, as I say, most of the traffic is done on one track.

Mr. F. C. Clark—Mr. President, don't understand me as wishing to protest against the opinion or experience of any gentlemen present. The only wish that I have is that where my opinions in the past or present are wrong I may be corrected. We want to get at the bottom facts in those matters, for our opinions go before officials and before the railroad world at large, and they are going to measure every statement that we make with a critic's eye. They want us to be able to back up and prove just what we state here. They want their experiences and observations on the railroads to be sustained by these expressions of our experience and opinion. At the same time I don't propose to discuss this question by putting a battered and worn out rigid frog beside a spring rail frog that is in good condition. I am perfectly willing to admit that when the stock rail of your rigid frog is worn down to that extent it keeps growing worse, the longer it remains in the worse it grows and the greater danger and liability there is of breaking your wheels, and the result may be disastrous. We admit that. Engines and cars are sent out unfit to run, and then complaint is made because our frogs and switches cause accidents. You know, and every gentleman here knows, that it is impossible, with that condition of things, to keep your track, and your frogs and switches, in perfect condition. We will approximate it just as nearly as we can. We have got to watch everything. As our president has very well said, one of the best things we can do is to surround that frog and upholster it, if you please, with that kind of material which is elastic, which will render the force of the connections so much less, and consequently the injury to our track and the danger to your rolling stock is proportionately less. Now, then, as the last gentleman has said, they have reduced it to a minimum, yet I believe that an element of danger remains with the spring rail frog which you cannot entirely overcome, but you may overcome it so nearly that it is practically safe. If it is safe, if our discussions here, and our opposition to the spring rail frog are driving these men to improvements which will render them practically safe, we are doing much for the safety of the traveling public in our country. That is the point I want to make, we want the best there is. When we can get that entire safety together with the much greater length of time that the spring rail frog will wear, we should want this frog everywhere. But we want to be convinced of that. Gentlemen, I would stand here if every other man in this room stood up and said "give me the spring rail frog," if I can find one reason or one doubt in my own heart for believing that there is danger. But when I am convinced that we have got a spring rail frog that is safe and practical I want it just as much as you.

Mr. Patch—I would like to ask brother Clark, as he is going against the spring rail frog very strongly, if he has ever had any trouble with the spring rail frog which has caused any accidents.

Mr. F. C. Clark—I have. I think I mentioned, when I was on the floor once before, that I had several of them.

President—We have a member present here to-day whom I used to meet several years ago, and he used to discuss freely frogs and switches with me and every gentleman he met, and I am going to call upon Mr. Hyland now. I remember meeting him at Fitchburg a great many times and discussing frogs and switches.

Mr. Hyland—Mr. President, I don't know as I can add anything. We find that every man has his own idea, and we cannot get him out of it. I don't know anything about the spring rail frogs that is against them. I have never had a wheel off. I get along with my track best with spring rail frogs, and don't want any stiff rail frogs in the main line. I like the spring rail frog, and don't want any of the others in the main track.

President—I would like to hear from Mr. Mosher of the Boston & Albany, as I understand they have rigid rail frogs wholly in the main line.

Mr. Mosher—Mr. President, we have no spring rail frogs whatever in our track, and I cannot say anything in their favor. I will say that with the rigid frogs we have had many broken and battered points, and I think the major part of that has been caused by double flanged tires. They are not as particular as they ought to be with a good many wheels, and I think that causes a great deal more real trouble than any other one thing. I would like to ask some gentleman here, putting a stiff rail frog and a spring rail frog in places where there is the same amount of traffic, what proportion of use you get out of each one? In other words, how much longer will the spring rail frog last than the rigid frog?

President—I would say that I think that question has been answered previous to the asking.

Mr. Mosher—I don't think I was here.

President—Mr. Patch made one statement which he will repeat for your benefit.

Mr. Patch—I have four spring rail frogs in the track, or had the day before yesterday, that were put in there in 1871, and they are good frogs to-day, or were when I left home, and I think that three years would be the extent of the life of a rigid rail frog where those frogs are.

Mr. Mosher—Is the traffic on those nineteen year old frogs all one way pretty much?

Mr. Patch—About, yes. I don't recommend the spring rail frog when there is just as much traffic on one side of the frog as there is on the other side, because they do no good then.

President—The chair would like to inquire of Mr. Mosher the reason the Boston & Albany gives the rigid rail frog the preference over the spring rail, and what the average life of the rigid rail frog is between here and Worcester, where the traffic is very heavy.

Mr. Mosher—I don't think we have a frog over ten years in the main track. We did have some stiff frogs, although stronger built ones, I think, put in in 1884. The greatest trouble is that we have a great number of breakages in the point, also in the wing rail, and I think the reason the points break is because it is rather difficult to get sufficient packing materials underneath them. The reason why they do not use the spring rail frog I cannot say, but they never have tried any at all.

President—Do you feel able to give the average life of rigid rail frogs on your main line?

Mr. Mosher—We have got the figures at Framingham, but I don't remember what they are. We get more broken frogs the nearer to Boston we get, where the travel is heavy and a great deal of switching. I don't think that I remember within the last year any report of a frog lasting more than three years.

President—I would like to ask one question further: How often do you think they have to be renewed on account of being battered opposite the point on the wing rail—can you give us that?

Mr. Mosher—At the Boston end they often wear out in five or six months.

Mr. F. C. Clark—I am very glad Mr. Mosher has given us one idea which has been referred to before, that the reason why those frogs which he mentioned as becoming useless after six months of service reached that condition was because they had nothing to stand upon, that is, the proper amount of material was not under them. I don't wonder, gentlemen, when I look around upon you that it takes a very resolute, determined and careful lot of men to do our work, when I find that we have got to make up for the deficiencies in other departments of our roads, because of their neglect in regard to our engines and cars; we have got to devise some method to circumvent them. I say, therefore, that we have got to make up for all deficiencies ourselves and be everything. We have got no rights seemingly, that any other class of railroad men are bound to respect, only as we fight our way to them.

Mr. Mosher—I would say that our road is discussing the matter of giving us ballast where we can use it for raising track. Where we go out from Boston where the head room is only 14 to 20 feet they won't allow us to raise a quarter of an inch, or to dig out the bottom that has been there for the last twenty years.

President—I don't think that it is anything against the spring rail frog because the Boston & Albany road don't use them.

Mr. Mosher—It may adopt them later.

Mr. Patch—It is only about five years since the Boston & Albany railroad was stocked with the Tylor switch from Boston to Albany, while all these roads right around them were using the split switch. They tried the split switch, and after they had put in one or two of them and saw how good they were, why, look at the car-loads and car-loads that came into Springfield, and now they have laid the whole road, I think, with split switches. Just as soon as they put in two or three spring rail frogs, and see how good they are, the good they will do, how they will wear, and their safety, you will find their road will be manned with them right through to Albany.

President—We would like to hear from Mr. Drew of the Old Colony.

Mr. Drew—Mr. President, in regard to spring rail frogs, I have got 100 or 150, perhaps, on my division, that have been there for 10 or 12 years, and never had any accident from them, and people who don't look out of the windows at stations don't know when they are passing through the frogs, they ride so nice. I never had but one or two break, and they didn't do any harm. The split switches we have ride very nice of course, though the points break down some, but we get along very well when we get the right kind of a spring to hold the point up to the stock rail. My spring rail frogs have castings on them at the regular distance at which we would put the rail for a stiff frog, therefore they won't get only so far off. As far as expense is concerned, I have had them in 12 years, and never shifted them any, and don't see that they are even worn any ; the rails are all smooth, and I should say they would last three or four times as long as a rigid rail frog.

President—We would like to hear from Mr. Braley.

Mr. Braley—I can't say anything more than brother Drew has said.

President—Mr. Lane, we would like to hear from you. I think you were not present during the discussions.

Mr. J. S. Lane—Mr. President, I have been at a little disadvantage, because this is the first that I have heard on the subject, but it is not the first thought I have given to the subject by a good deal. As I have stated here at two or three of the last meetings, on the Hartford division of the New Haven road there are two spring frogs that were laid in June, 1880. The old frogs are there yet, and to all appearances are just as good and just as safe as when they were laid. That is 10 years ago last June. On one track in which one of them lies is a rigid frog. That frog is the third or fourth one that has been placed there since the spring rail frog was put in on the same track. As to the result in economy and wear, the same wheels roll over the spring rail frog which is now good after 10 years' wear which rolled over the three other ones now out and the fourth one now in place—if not the fifth the fourth one sure ; there have been no more wheels over one than over the other. That is a good fair estimate of the value of a spring rail frog as compared with the rigid. The spring rail frogs are good, and to all appearances will wear out several rigid frogs on the same track yet. Now, as to safety of the spring rail frog, I claim that when that frog is laid properly, and is kept in good solid condition, it is just as safe as any rigid frog, and I believe safer, taking everything into consideration. If anything happens around the frog, it is at once laid to that fatal frog of course, no matter whether the frog was to blame or not. They say nothing about some other cause, it is all laid to the frog because the frog happens to be there. Every old trackman has found marks many a time where the wheels have left the center of the rail. What is the cause of that? There was a good smooth track, and the mark is plain where the flange of the wheel mounted the rail in the center of the rail. I don't say joint, you find it in the center of the rail. They don't condemn that rail because for some reason the flange mounted and went over outside ; but the moment anything happens about a spring rail frog then that spring rail frog is condemned, and where there is one accident happening on a spring rail frog I believe there are ten on a rigid frog. You get no battered points, you get no broken wheels from switching on spring rail frogs. Perhaps you don't on the rigid one just there, it may not break just at that point, but most of those are caused by running over frogs, most of them, I don't say all are. As I am situated now, I can stand squarely on my feet for a spring rail frog. They can't say, "Lane is doing it because he is using them." I am not using them to-day. I am not afraid to go on record as a man who put them in, and a man who says that if they are kept in proper condition they are the safest frog there is to-day.

Mr. Ellis—I would like to ask a question for Mr. Patch or Mr. Lane to answer: Though I am a believer in the spring rail frog, whether there is not an element of danger when it is placed on the outside of a curve where the thrust of the wheel is against that spring rail, if it is not properly made, or made as some have been made in the past; if they have had any trouble I want them to state it, and tell any facts that can be brought out against them.

President—Mr. Lane, have you any reply to that question?

Mr. J. S. Lane—My reply would be that the spring rail is safe. If the frog is properly made, with point protected, you have got to have a heavy surge if you move that rail with the weight of the wheel on it; and with the guard rail opposite, which has the effect of a rigid frog, I don't know where there is any element of danger there, certainly not as much as with a rigid one.

Mr. Ellis—The question is where you are running through trailing, with the edge of the tread of the wheel striking that spring rail and forcing it out, whether there was not an element of danger.

Mr. J. S. Lane—What I call a properly made spring rail frog is with a check underneath, so that the rail cannot possibly go out beyond what would be a rigid frog or the opening of a rigid frog point.

Mr. Ellis—I have another question to ask these gentlemen who have had the most experience with the spring rail frog, whether they would have the spring as I have stated here was my suggestion, about four feet ahead of the point, where I have got the point marked "A", (refering to diagram) or, as some makers have it, back towards end of the spring rail; also, whether they would have a check of some kind placed on the long ties ahead of the point, say a guard rail brace, placed against the spring rail, when it is made a rigid rail frog; also, what has not been brought out to a great extent—whether if you do use a plate or do not, as I have represented, under the point, the ties that go under that plate or under that portion of the spring rail frog and back as far as the spring rail extends, should not be kept always in first-class condition? We are apt, as trackmen, I think, to procrastinate in the renewal of long ties; it takes more time, it costs more labor, which we are generally short of. That is why I ask the question.

Mr. W. E. Clark—I would like to answer the gentleman in this way, in regard to my practice: I put a guard rail brace there (indicating on diagram) first opening this spring rail an inch and three-quarters, and have a long tie at this point (indicating.) I use long ties under a fifteen-foot frog, commencing at the heel and going through. They are eight by ten and thirteen feet long. After getting the ties in, before spiking, I spread the spring rail to an inch and three-quarters flangeway. There are three or four ties under the plate, some three, some four, and on the plate a stop block riveted, so that it opens an inch and three-quarters. In addition to that I place a guard rail brace just at the first tie, ahead of the plate, so that it cannot possibly open but an inch and three-quarters.

Mr. Ellis—Just to allow it to move an inch and three-quarters?

Mr. W. E. Clark—Well, a little more, just a trifle, to make up for the spring. Then, on the opposite side on the main line I have my frog guarded for about 9 feet, generally the whole length of the spring rail is guarded, and three or four guard rail braces to every guard rail.

Mr. Ellis—By being guarded you mean for one and three-quarter inch flanges?

Mr. W. E. Clark—One and three-quarter inch flangeway, for about nine feet. I cannot see that there is any element of danger in a frog secured in that way. As for condemning a frog because a poor wheel runs over it, I think that is a little rough on the frog.

President—Mr. Hyland, we would like to hear from you. I believe you have not spoken on this subject.

Mr. Hyland—My practice with the spring rail frog is the same as Mr. Clark's. I fix it so that the spring rail cannot get out any further than an inch and three-quarters, and I have never had any trouble with the spring rail frog devices, although in one case the spring broke ; the bolts that held the spring at the throat broke ; there were no braces on that at that time, and the engine went into it. They were just starting, and it did no harm. I immediately put braces on the rest of them, and have had them on ever since. The great trouble in the wear of frogs, in my experience, is the same as the rest of you find, that it is through guttered wheels. They tear frogs all to pieces. Our railroads run the wheels until the flanges are very high on the outside, some of them, and they tear the frogs and switches all to pieces. That is something I cannot help, if I could I would.

Mr. Patch—I think the spring rail frog has been discussed pretty thoroughly at this meeting, and at all of our other meetings that we have had, as well as by the Association of American Roadmasters at their meetings. I don't think you can find any Roadmasters who have ever advocated the spring rail frog who have changed their minds up to this time. I think the longer they use them the better they like them. It is very sure that we have good, smart men amongst our superintendents, practical men, men that study into the track business, as well as the running of trains. At their association meetings this subject has been brought up, and they haye adopted that as the standard frog for main lines—the Superintendents' Association. The New England Roadmasters' Association has adopted that as their standard frog, and the Association of American Roadmasters has adopted that as their standard frog. Now, I think that that is a pretty good point to bring up for the spring rail frog.

Mr. J. S. Lane—I would like to say one word further about the spring rail frog. After the war, in 1865, I was on the road. We used the spring rail frog made of 50-pound iron rail the whole length of the Housatonic road. We had no spring at all, we had a plate under where we now put the spring. The spring was all in the rail. We used those frogs from 1865 to 1868 or 1869. As engines became heavier we used occasionally to have one break at the point. Well, now, in that ten or eleven years' time of my experience in using the spring rail frog, and since 1881 again, I never have known of a spring rail to break at any other point except at the point where it was weakened by having the base of the rail cut out to set up against the tongue of the frog. In all that time I never had a wheel off from any other cause except from that breakage at the point, and excepting that one accident last summer, which was no fault of the frog. If it had been, ten thousand wheels, yes probably double that, that have passed over it since ought to have condemned that and all other spring rail frogs. When we get a frog that will ride so that no wheel will know when it passes over that frog from any concussion, I cannot see why we have not got pretty near perfection, pretty near—well, as near perfection as you can get.

President—Gentlemen, the question here confines us to our experience and decision about the greatest cause of renewal of frogs and switches. As Mr. Patch has referred to the adoption by this Association and the Association of Superintendents of a standard frog—I don't understand that we adopt any particular frog here to-day, we tell our experiences, and decide from those and our opinions the greatest cause of their renewal.

Mr. F. C. Clark—Mr. President, I want to say just a word more in regard to frogs. I wanted at the outset to provoke a thorough discussion at every point. I had an object in this. I wanted every argument, so far as I could have it, made by somebody else. There is only one more point that I would state. Every gentleman who has come here has pointed to this frog (indicating the diagram), and said, in substance, "I put on a guard brace here," that if any such thing should happen, "I put in spikes here," to protect against such a condition of things. Now, I don't believe I should ever hire a man to watch my melon patch if I was not afraid some one would steal my melons. That is all I have got to say, gentlemen, in regard to frogs. There is one point, if our question is sufficiently extended to admit it, that I would like an expression upon, for the same reason that I provoked the discussion on the frog question, and that is, the advisability of using in connection with our split switches a guard rail at the point. And, first, in order to draw you out, I will give you a bit of experience. I had two derailments in the past season, one last March, and one about eight weeks ago, caused simply by a brake beam dropping down, striking the end of the guard rail, forcing it out of position, striking the point of the switch throwing it over, in each case one end of the car going down the main track and the other end on the side track, and you can imagine something about the results. I, of course, am satisfied in my own mind, but I want an expression of opinion, if the chair will permit it and the subject gives us the privilege of stating here, as to whether the guard rail is not in itself an element of danger, rather than of safety. I fail to see any benefit we can derive from it. Those two experiences in my own mind have condemned it. Now, gentlemen, I want you to say whether I am right or wrong.

Mr. Greer—I would like to have Mr. Clark say, as to this question, Have you got spring rail frogs in use on your road now, and how many?

Mr. F. C. Clark—I cannot without a little time just at present give you the exact number. I have a number, and I like them very much.

President—We would like to hear from Mr. Jackman on the subject of frogs and switches.

Mr. Jackman—Mr. President, I may say that I am a firm friend of the spring rail frog. We have used them on the road that I represent somewhere in the vicinity of 12 years. I have on my division, I think, somewhere between 50 and 60 spring rail frogs, and we have laid them all over, because the first that we laid were made of 60-pound steel and we have changed them to 72. We thought that the frog made of lighter steel was the better frog, and wore better. It may be in the quality of the steel. But they are both good frogs, they wear well, we like them, and I should not want to stand up for a stiff rigid frog, not for my own use. The greatest cause that we find for renewal has been, as stated, defective wheels. I think it wears the stiff rail and sometimes the loose spring rail at the point. The split switch I cannot say anything about, because I don't know anything about them; I haven't one on the road.

Mr. Patch—Mr. President, I would like to ask brother Clark one question; I would like to ask him if he still uses the guard rail at the point of his switches?

Mr. F. C. Clark—I will say to that that I have them in, but I am not putting in any where I am renewing switches. I want your ideas regarding same for my own benefit. I ask this as a favor to me, which in the results may do us all good. I don't believe in them myself, for I have never felt that they were of any practical benefit. I believe them an element of danger, and I would like to know from your experience, gentlemen, how many of you have found them so.

Mr. Patch—I would like to ask Mr. Clark one more question: Do you think that you should take out the guard rails that you now have in the track at the split switches?

Mr. F. C. Clark—If I am ordered to leave them there I do.

Mr. Patch—That is what I wanted to get at, because he made the statement that if there were more elements of danger in a spring rail frog than there were in a rigid frog he should condemn the use of them, and he did state that he thought there were more elements of danger in having a guard rail at the point of the split switch, that is, he did, and does. That is what I wanted to bring out. I don't believe in the guard rail where there is a split switch. Every switch that we have on the main line is a split switch, and I have not got any guard rails, and never had any, to any of my switches. I have them on the outside of a five degree curve, where I run towards the point.

Mr. F. C. Clark—If our reporter says that I made such a remark the record will show it, and I will admit it. I will repeat what I think I said: If the spring rail frog showed an element of danger that was not found in the rigid frog, the economy of the spring rail frog was purchased at the expense of safety. I hardly think I said that I would condemn it. My only idea was to bring out all the discussion I could upon every question. For I thought, we have got men looking this over, men whose opinions vary, perhaps, from my own, and I think that we can secure the best results by bringing these questions right up here, and letting these men state their experience, and tell us what they have found. That helps us, and can do none of us harm.

Mr. Drew—I have probably 150 split switches, but no guard rails about them. I consider them the same as having five wheels to a coach, of no use.

Mr. J. S. Lane—I have been a strong advocate of a short guard rail in front of the point of the split switch, and am yet. We all know how an accident occurred on the Providence road sometime ago, from a broken journal; one wheel dropped down, and was running along inside of the rail, and hit against the point of the switch, shut it up, divided the train and caused a pretty bad accident. I cannot state just now where, but in my mind there are some three or four that have happened from the same cause. I advocated a guard rail at our meeting in the west last year strongly, and I believe some of the western men finally admitted it would do no harm. On my return from that meeting, as I was passing through a certain place, I found where a wheel had been running along inside the rail, and it came to this guard rail, which threw it out of the position it was in, and it passed over the switch all right. I can show you the marks of three such to-day, where had it not been for the guard rail it would surely have interfered with the switch point, and probably have caused an accident the same as that I spoke of. I have known of one accident being caused by a brake beam getting down, striking against the end of that guard rail, which hit the point of the switch, and as it continued to move ahead closed up the switch and divided the train. But with that guard rail it was the same as an imperfectly laid spring rail frog, the guard rail had not been properly laid. I have a brace in each angle of the guard rail, and when properly placed and spiked a wheel striking it though running very fast and very heavily loaded would come up on it every time. In some 200 guard rails that we have laid with 72-pound steel we had a hole drilled in both ends, so that we could bolt to the rail if necessary. I have had no occasion to fasten any of them. I lay them with a brace in the angle at each end, and then spike, and I am not afraid of any one of those guard rails moving.

Mr. Patch—I would like to ask Mr. Lane one question: At what distance do you place your guard rails for the split switches from the main track rail?

Mr. J. S. Lane—Two inches. I would say, brother, I never intend that guard rail to be touched by any wheel that is running properly on the rail. It is only in case of a loose wheel running down on the inside, which is sure to throw your switch and cause an accident, unless you have a guard rail there.

Mr. Patch—You must have a terribly loose wheel that will work on so as to get to the other side of your point four inches.

Mr. J. S. Lane—I don't believe brother Patch can say that he never saw the track of a wheel running inside of the rail. I rode behind one two miles.

Mr. F. C. Clark—I want to say here that the two guard rails that I had that were moved out of place were both spiked as Mr. Lane's, only I had two on one and three on the other, one in this angle and one in the other, and a brace in the center. But as it struck it with such force it turned, struck the point switch, threw it over, so that the flange of the wheel caught it and threw the whole switch. As has been said by Mr. Patch it was a broken journal.

Mr. Holbrook—I would like to answer Mr. Clark that as to three braces on the guard rail, I consider three braces as bad as none at all. It makes something on which the guard rail will hinge, and therefore it will have a very good opportunity to catch the point of the spring. I think that the guard rail should have four braces at any rate, and in that case it would have nothing to hinge on and it could not get away. In regard to the guard rail at the point of the switch, I have put them on at the point of some switches on the stock rail side where there has been a good deal of switching, simply to pull them away from the point of the switch and prevent wearing of the point. I have some point switches on a 23 degree curve, where we had to pull the wheels away from the point of the switch a great deal to prevent wearing, but on a straight track I don't think I should ever put on a guard rail. We have them, but I think we found them there when we came there. Then there is another thing in regard to the wheel, one great cause of renewal of point switches. I don't know that it has been mentioned here, there was some discussion on the subject before I came, and it may have been. That is the grounding of the switch point. If one is not very careful the switch point in the main line rail will very shortly get down, especially when the heel of the switch is laid even joints with the main line rail. I know it is not a common way of laying them, but still on my road it is oftentimes done, and I think this subject well worth mentioning, that is, breaking joints in the switches, not having at the heel of your switches a joint in the main line, always make it eight or ten feet away if possible. And then there is one other point, and that is the kink; I have kinked rails so that the point of the switch was not further than six inches from the end of the angle bar, and I have not had any trouble with them in that way.

President—We would like to hear from Mr. Sibley.

Mr. Sibley—We have all split switches on our road, a single track road, and of course running against the points of all of them. We have got that guard rail, and think it is an element of safety. Ours are all running against the point in a single track only. We have guard rails on all switches now, and believe in putting them on. We have not had any accident from anything striking or catching the guard rail, although we had an accident some time ago where the guard rail turned the wheels of an express train.

President—Mr. Spaulding has given a good many ideas in that report, of course, but not all that he has. I would like to hear him say a word about frogs and switches in his experience.

Mr. Spaulding—I did not expect to be called upon. I came in to hear the remarks, to hear the different opinions of those present. In regard to frogs, we have a good many kinds in use, from frogs that we commenced with in the early days of railroading ; we have got those in use now, or the same patterns, more or less, which work very nicely ; but after the rolling stock became so heavy they were not found suited to stand the pressure, and then we tried to do away with them, although we have a great many of them now in use. The spring rail frogs that are used on the Fitchburg road we have used a great many of, and have a great many of them still. They are mostly in use on the main line over the entire system. We have never had any serious trouble with them as far as I know, and I would be glad to listen if any one has any better frog than the heavy spring rail frog. Properly set we consider them the safest frogs that are in use.

President—While I would not like in any way to stop the discussion of frogs and switches, it seems to me we have discussed it pretty thoroughly. It is now twenty minutes past eleven, and we have two more questions to take up during the day. If we have thoroughly discussed this to the satisfaction of all concerned, I wish that there might be some disposition of this subject. If any member has any new ideas to suggest, they will please do so voluntarily.

Mr. F. C. Clark—For our own mutual good, and particularly as a favor to me, I would like to make a motion, if it is in order ; I would like to have every member vote, if he is in any way prepared to vote, not from theory only, but if his theory accords with the motion well and good. I move you that it is the sense of this convention, that guard rails at the point of split switches, so called, are an element of danger rather than safety.

Mr. J. S. Lane seconded the motion.

Mr. Spaulding—I could not vote on that without knowing more than I do now; I don't know an instance of a guard rail ever doing any harm; I never had any results with or without sufficient to act upon.

Mr. F. C. Clark—I would say in reply to the remarks of Mr. Spaulding, that when the wheel moves so far over on the rail that the flange may catch the point of the split switch located four inches from the main rail, it will be fair to infer it will be on the ground.

Mr. Braley—Brother Drew told us how many switches he has, and that they are not guarded with a rail. I have been instructed by our chief engineer to put guard rails to the point of all leading switches, that is on single track, we don't put them on double track trailing switches ; I suppose he does just as he has a mind to down on the Cape, but if he were up here he would have to do so. We do it for the reason that sometimes there is a chain dragging or trailing, thinking that it might catch that, and it might catch the switch if the guard rail were not there. I have known of no cases of derailment in consequence of the guard rail.

Mr. Stickney—I would like to ask Mr. Clark if the same thing that broke his guard rail would not have struck the point of the switch and broken it in the same manner?

Mr. F. C. Clark—Perhaps it would, but not in the same manner. There is a possibility that it might. I cannot say as to that. I am only dealing with facts as I see them.

Mr. W. E. Clark—I have had an experience in the last six weeks of the same class that brother Clark has been speaking about. But I did not have a guard rail. It struck the point of the switch, opened it part of the way, and the train took both tracks.

Mr. Sibley—I would like to ask if those two instances are sufficient to condemn the guard rail?

Mr. F. C. Clark—I would answer the last question by saying no, it is not enough to condemn a practice from two experiences. But never having derived, so far as my knowledge is concerned, any benefit from guard rails, and having been damaged to the extent of those two derailments by the use of them, I come here to ask you all your opinion, so that I might know whether it was advisable to fully condemn them. I said I had condemned them in my own mind and for that reason; and I might not have another in ten years and might never have another, I don't know. I want your experience and opinion.

Mr. Holbrook—I think those guard rails might have been prevented from being driven ahead if they had been bolted to the main line rail. I have seen a guard rail opposite the frog bolted to the main line in that way with filling in between, the same as frogs have, and a bolt passing in.

President—Gentlemen, I am interested in this very much. I am putting in point switches every day, and am not guarding them, but I don't see how we can quite entertain that motion on this account: For instance, I think there are a great many here that do not like to be placed on record in favor of or against them, and I think it is placing the members in rather close quarters in this motion here at this time, that does not come under the question. You will have the courtesy to withdraw the motion, I make that ruling.

Mr. F. C. Clark—If the gentleman who seconded my motion will consent I will withdraw it.

Mr. J. S. Lane—I withdraw it with pleasure.

Mr. F. C. Clark—I don't want to place any Roadmaster in a false position. I want to know their experience. We come here to be benefitted, to benefit each other, and if we could get an idea in regard to that it might aid us a little. However, I cheerfully withdraw the motion.

Mr. J. S. Lane—There is just one word I would like to say on the question of switches and frogs. The same cause that shoved the guard rail ahead would probably have moved that switch, and in my mind it would not only have struck that switch point but possibly might have disarranged the rail opposite as well as that switch. I believe that there would not have been one chance in a hundred but what it would have disarranged that switch if the guard rail had not been there.

Mr. F. C. Clark—I will say in regard to this derailment that I think that if that guard had been properly secured it would have saved a derailment, secured as usually done.

Mr. Sibley—In this derailment that I was speaking of a short time ago we had the guard rail secured so firmly that it twisted the rail before moving it, the rail was twisted and not moved.

Mr. Braley—I would like to ask the brother if he thinks it necessary to go to the expense of bolting all those guard rails, that there is advantage enough in it to go to the expense?

Mr. W. E. Clark—I never advocated that, I never found it necessary. I use guard rail braces at all the guard rails, and thoroughly spike to good sound ties.

Mr. Bodwell—I would like to ask Mr. Clark if it was the fault of the track, the moving of the guard rail?

Mr. F. C. Clark—I hardly think so. The guard rail was as we usually make them, about five feet long, besides the angle that turned out either end, a brace put on near each end at the angle, and in one case there was a brace spiked on the middle. One of the foremen was to have the other brace there and put it on; he was not ordered to do so, and it was finally spiked, and would not ordinarily be moved. Something gave out, certainly, a journal or something. In this case it struck it dead on the end, and simply forged it ahead. The angle of course turned out, struck the bend of the switch and threw it over.

Mr. French—Mr. Clark, may I ask you whether your guard rail curved to a point about six or eight inches from the main line rail?

Mr. F. C. Clark—About five inches it is turned away; I think that is the opening at the extreme end.

Mr. French—Mr. President, our time is going fast, and we have had a long discussion on the wear and tear, and the greatest cause of renewal of frogs and switches, and I move the adoption of this resolution:

*Resolved*, That the main cause of renewal of frogs and switches are three: Poor wheels, difference in gauge of cars running over the same road and neglect in care of the frogs and switches by trackmen.

The motion was seconded by Mr. W. E. Clark, and carried unanimously.

President—There is a subject that our secretary will present at this time.

Mr. French—In addition to the resolution expressing our deep and sincere regret at losing the services of our efficient secretary, Mr. William F. Ellis, and also our resolution expressing thanks for his long service in behalf of our Association, which resolutions were passed during our session yesterday, we had intended to manifest at this meeting our gratefulness by presenting him with an album, containing cabinet pictures of the members of this Association, thinking such a gift would be greatly appreciated by him. Owing to a lack of time we have not been able to complete this plan, though a number have brought their share, and I move that this matter be placed in the hands of the executive committee for furtherance and completion. We sincerely hoped to have taken this pleasant action in connection with the regretful one of accepting his resignation, and I would also move that this be embodied in this year's pamphlet. I make those two motions.

The motions were duly seconded.

President—Gentlemen, you have heard the motion as stated. It is with much regret that I am compelled to put this motion. It is not through lack of courtesy or heartfelt appreciation that this neglect has taken place, the members did not receive sufficient notice to bring this about; but I know very well that all are willing, and more than willing, to do their share in bringing this about when time will permit them.

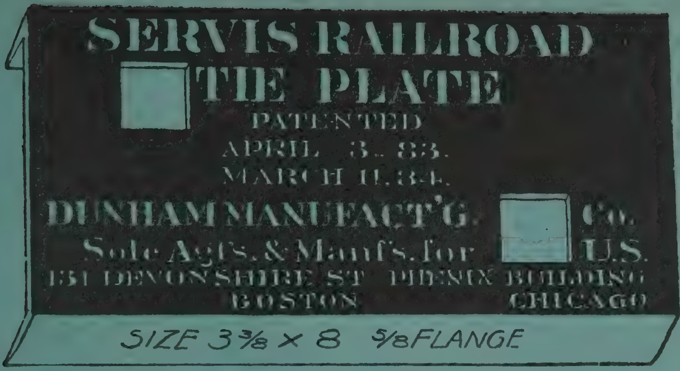
The motion was then put and carried unanimously.

Mr. French—I would like to state that Mr. Stevens, who is kept away by sickness, has gladly sent his share of this testimonial to Mr. Ellis.

Mr. Ellis—Owing to a little business I had to be away from your meeting yesterday, and was not present when my communication to you resigning as an active member was read. In that I stated that I should not at this meeting be prominent, but I have overstepped somewhat the bounds of my intention. This testimonial that you propose to give me will, of course, be acceptable to me, and also be a very great pleasure in future years, especially if I leave this part of the country, as I shall probably have to do if I follow the business that I am now engaged in. My territory is to be west of the Mississippi, or west of Chicago, and for that reason I may not be with you another year. Of course if I am with you another year it can only be as a spectator. As I said in my communication to you yesterday, I may, if not present, send you a paper on anything that I notice in my trips that I am making through the country that I think will interest you, though I will not in any such paper bring up any device in which I am interested as a supply man. I would state to the members that when I met some of them who are present here to-day at Worcester I was a stranger to them. You saw fit to elect me your secretary, which office I have held up to last year. At that time I had just had the duties of a Roadmaster put upon me. I had been in past years a civil engineer, engaged principally upon building new railroads. And the little knowledge that I had regarding railroads was principally theoretical. But my intercourse with you, gentlemen, by the questions that were put, and the answers that were given to questions, in your meetings, I was enabled to gain a knowledge of practical work, and the manner in which it should be done economically. I was enabled to see that theory was right to a certain extent, but by practice the corners of theory should be rounded somewhat to answer the purposes of economy, especially in the maintenance of way. I have had charge of more than one department of the road that I have been employed by; but of all the departments that I had charge of, I must say that the road department, from what I learned of it by being placed in the position that I was, from seeing you gentlemen at these meetings, and getting knowledge from you, was the department that I loved best. Although the Providence & Worcester road when I entered upon it was not in first-class condition, I can say that it did belong to the list of first-class roads of New England when I left it last April. If any credit gained for that condition is due to myself, it is also due to you members of this Association from the intercourse that I have had with you. I should say that it is also due to the superintendents that I had above me. I refer especially to Mr. William E. Chamberlain, one who was progressive in his ideas, one whose directions to me were to always do the work of this year in such a manner not only so that the fruits would come this year, but so that in future years we would see the fruits of this year's labor. Also he left the heads of departments alone in their work, not giving orders to men under the head, so that the head of the department alone was responsible for his work. The superintendent that followed him after the first year, when we had become acquainted, trusted me in my duties. I would also state that I had good foremen, which we all so much desire. I think the Roadmasters present will agree with me that the question arises, where shall we get good foremen for the work to be done? There is no inducement held out to men of experience to go upon the track and learn the work to be done. What further I would say relates to what I would like to see done, if you will bear with me. I believe it is the duty of Roadmasters to-day to see if they cannot reduce the amount of Sunday work which is done by using electric lights; they can now be very easily erected, and some of the work that is done on Sundays can be done at night. I know that I have done in some of the departments that I have had in charge a great deal of Sunday work that I think was needless; and I know that when I work continuously for three Sundays I am not half a man, and the trackmen that do work are not half men the fourth week, and we had better even give them Monday, because if they have to work for three Sundays in succession their condition is such that they cannot do good work. Also in the manner of your giving orders to the foremen. I think they can be given in such a way that you get their respect and the respect of these men is not taken away from them. Have pleasant dealings between your foremen and yourself, as you yourself expect that the men above you, your superior officers, will treat you in the same manner. Do unto others as you love to be done by. I thank you all for the pleasant relations of the past, which I hope will continue in the future whenever I meet you; and if I am not with you at your meetings, you will know that I am with you in spirit. (Applause.)

President—Mr. A. C. Stevens, whose face, so familiar in the past, we miss from our meeting this year, has sent me a communication expressing deep regret that sickness keeps him away. He desires to be remembered to all and wishes us a successful meeting.

There is this subject of excursion that I would like to mention at this time. Perhaps there are some members who have recently joined, who have not heard of this invitation to the Hoosac Tunnel and return. Mr. Turner, the Chief Engineer of the Fitchburg road, has extended



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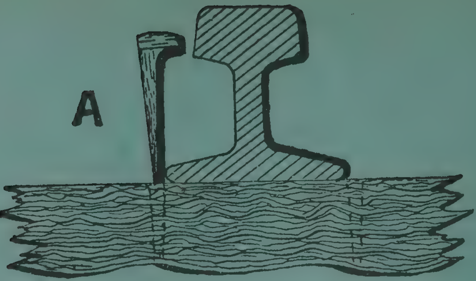

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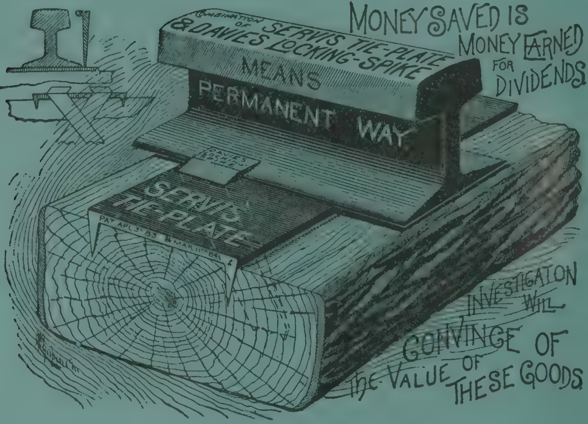
COMBINATION OF SERVIS TIE-PLATE & DAVIES LOCKING-SPIKE MEANS PERMANENT WAY
MONEY SAVED IS MONEY EARNED FOR DIVIDENDS
DAVIES LOCK SPIKE
SERVIS TIE-PLATE
PAT. APL. 3-83 & MAR. 11-84
INVESTIGATON WILL CONVINCE OF THE VALUE OF THESE GOODS

Correspondence Solicited.

**Dunham Manufacturing Co.,**

*703-707 Phenix Building,*

CHICAGO, ILL.

to the members of the New England Roadmasters Association and their ladies a cordial invitation to a trip to the Hoosac Tunnel, North Adams, and return. I would like to know how many will go, so that I can tell how many to provide for.

On motion of Mr. French a recess was taken until 1.30 P. M.

## AFTERNOON SESSION.

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August 21, 1890.

The President called the meeting to order at 1.30 P. M., and it was voted to hold the Ninth Annual Meeting in Boston, on the third Wednesday of August, 1891.

### RAILROAD TIES.

President—The next question to be discussed, gentlemen, will be the following: "Railroad ties; dimensions, position, and number to be laid per mile under 56, 60, 72 and 76 lb. rails." The secretary will read the report, so that you can discuss it understandingly.

The secretary read the report of the committee. (See page 15.)

President—Gentlemen, please proceed with the discussion. Mr. Shanks will you lead off?

Mr. J. W. Shanks—Mr. President, the committee's report strikes my mind exactly to a tie. I believe in a 9-foot tie for track. The bearing is better, and with 3,000 to a mile I think there is no question but what we could not only hold our track to a good surface, but also to a good gauge. I don't think there would be any difficulty about its spreading. And I believe that seven inches is a proper thickness for a tie.

President—Mr. Patch of the Connecticut River Railroad.

Mr. Patch—I don't think it is necessary for me to say anything on that question at all, because the report covers the whole ground. I am satisfied, and should like to have that report adopted. I cannot say a thing against it, or anything for it, because it is all there, and speaks for itself.

President—Mr. Collins.

Mr. Collins—The report is a little better than what we get.

Mr. Drew—Mr. President, the number of ties to the mile and the face would be all right, but the 9-foot would not be all right. They would have to be brought a good many miles, and cost a good deal, and the ties extending out over the embankment would necessitate an annual filling off. A good tie which is eight feet long, and of proper face, laid 3,000 to the mile, ought to tie a railroad in pretty good shape.

Mr. F. C. Clark—I have not got much to say, Mr. President, only this: I cannot agree with the report in regard to a 9-foot tie, because I think an 8-foot tie is long enough, and amply sufficient to do the work that is designed for the tie. When you get your roadbed so that you can fully and securely support an 8-foot tie to the extreme end of the tie, you have got enough to support your track. You find that it is not the outer end of your tie that shows the wear, it is where the rail comes. You have no trouble with your tie if the roadbed is all right. I fail to see any necessity for putting that increased expense upon our railroad corporations, because I cannot see any benefit to be derived from it.

Mr. French—I look at it as Mr. Clark does. In a great many places now we have no shoulder at all, not even enough for an 8-foot tie. I think that if we have an 8-foot tie and plenty of shoulder, we have all that is necessary. Of course the size of our ties must be regulated by the supply of timber along the line. I think the main point, when you come to the number per mile, is, to have the total bearing a certain amount. If your tie has a narrow face, and you can't get ties of a large face, you can get along by using a larger number. I should put in to a mile 3,000 at least. I don't believe in recommending a 9-foot tie, because we cannot get them. It is hard work to live up to the specifications now and get just what we want, because there is a great deal of competition where roads are together. We have to take a great many times ties inferior to those we desire. I don't believe in adopting that portion of the report recommending a 9-foot tie.

Mr. Mosher—I think an 8-foot tie is amply long enough. Four feet shoulder is ample for an 8-foot tie ; for a 9-foot tie you must have more shoulder, and you have additional expense in making embankments wider. With good ballast under it an 8-foot tie is amply sufficient. As to the number of ties, I think the system we use of having 16 ties to a 30-foot rail is ample, provided you can get ties of not less than 5 inches face. When you come to a side track, where the traffic is not heavy, it may be well to put a tie every two feet. That gives pretty good satisfaction. I wish it could be brought before the Association in some way, and limit the number of ties. I wish it could be the sense of this convention that an average of 6 inches face is enough. Again I find in buying ties in competition with other roads considerable difficulty. A man will cut ties for the Old Colony R. R. They want a tie six inches thick. We buy the 7-inch tie, prefer to take none less. Many times a man will come to me with a lot of 6-inch ties, and we only give him twenty-five cents for them. I think we should arrange with the Roadmasters to have them seven inches thick, then say a quarter of them could be six inches for side tracks. Speaking about the 9-foot tie being rather difficult to get, I think it is about all you can do now to get 8-foot ties.

Mr. Holbrook—I think that a 9-foot tie would be rather long for any road that is not a single track. There are a good many places on our double track roads now, and it is more noticeable on four track roads, where you have to dig out pretty deep to get in ties, on account of signal boxes, and one thing and another, running along with the track. For various reasons you have to dig out five or six inches below the bottom of the tie to get it in. Putting in a 9-foot tie would cost a ninth more than putting in an 8-foot tie, and would add a ninth to our road bills, which would be a pretty heavy expense per mile of road. Another thing: There are very few ties on roads that have heavy traffic that rot out anyway. Most ties are spiked to death, cut off at the rail. Of course this ninth extra expense would show more noticeably on those roads than it would on the roads where the traffic is not so heavy, and where the ties rot out. As to the face of ties, I think that six inches is a pretty light face, and requires more new ties than if you have more face. If you have 3,000 to a mile you have to put in more ties in the course of the year, and it would cost just as much to put in a small tie as a large one. If you have an 8-inch face on your ties you would not require so many ties to the rail; you can tamp them pretty well, too, and tamp an 8-inch tie practically solid with a tamp bar. You would have to put in, presumably, —well, two ties less, to my personal knowledge, to a 30-foot rail, with an 8-inch face. You cannot put in a tie on gravel ballast for less than fifteen cents much. That is thirty cents saving on every rail length in the course of a year by having 8-inch ties instead of 6-inch.

Mr. F. C. Clark—I said nothing in regard to ties, except as to length, when I was on the floor before. I think it will be generally the sense of this convention that an 8-foot tie is long enough. I think we have all noticed sometime in our experience where you find a tie that has been in the track long enough to become somewhat tender and old, and wherever you find a tie broken by the rail, you will always find the outer end, instead of going down as a point of support, turning up. A tie may oftentimes break in the middle in the spring of the year, when the frost comes out from under the end of the tie, leaving no support and the center rocking. That is no proof that an 8-foot tie is not long enough. Again, I think the more narrow we can keep our roadbeds, and have gravel to support our ties, the better we can drain it, and the quicker all water that gets into the roadbed will find its way into the drain, and flow off where it will do us no harm. In regard to the size of ties, the thickness of them, that is a point perhaps worthy of a great deal of consideration. I would prefer to have not less than six inches face. My system is, however, to make three classes of my ties. I do that for a special purpose, to reduce, if possible, the cost of the tie. I make three classes. Those that are six inches face and over, from six to seven inches, I term second-class, seven inches and upwards first-class, and those that are under six inches are third-class. Our ties are all six inches thick, or supposed to be. I would like, however, if it were practicable, if we could secure them for the same money, if I can have the very best, I would like a 7-inch tie very well. But our ties, I will say, those that are six inch, are ample support so long as the tie will last. The rails cut into the tie, and the ties are worn out in that way before they are decayed. Therefore, it would be an argument in favor of the thicker tie; you could adze them off a little before, and still have the same face. Everything considered we approve of the 6-inch tie, in my own experience, securing the face in preference to the thickness of the tie, although we use both classes, first and second, in our main track. The others we use in side tracks. Possibly we have sometimes put in some of them, if we found a scarcity on account of the weather which prevents people from carting the ties to our road, we may sometimes, for a small portion of the way, have used some light, third-class ties in the main track. I have used them, and I must say this, that third-class, our smallest class of ties, are usually a better quality of timber, of firm, white, second growth chestnut, and when you get those ties under the rail the track will last longer, and the ties will last longer than your old growth chestnut, where you have even a 7-inch face.

Mr. French—Mr. President, as I said before, the size of the ties will necessarily be regulated by the supply of timber along the road. We want to recommend something that we can get economically and use. I move that we adopt as a standard tie one that is eight feet long, not less than six inches face, and seven inches thick, 3,000 to the mile under all weights of steel.

Motion seconded by Messrs. Patch and F. C. Clark.

Mr. Mosher—I think the gentlemen will find a great deal of difficulty in buying a tie of that size. I don't think if there were any other market for their timber that they would sell ties of that kind. I know that their great cry is that we ought to buy more of the old growth. As Mr. Clark says, the second growth of timber is a great deal better than the other. We like to have timber that is not over nine inches in the upper end or fourteen in the butt, because beyond that you have to pay more for it, and the timber is no better.

Mr. French—I have bought over 150,000 ties in the last year, and with the exception of the seven inches thick they were of the dimensions I propose. We have not accepted anything under six inches face for first-class, and they have been eight feet long. I believe, however, in a thicker tie. I believe we can have stiffer track, better surface under passing trains with a little thicker tie, so I thought it best to adopt seven inches as thickness of tie. I know we can get them, from the experience I have had.

Mr. Mosher—What is your average price for ties of that kind?

Mr. French—For a tie seven inches face we have paid forty-five cents.

Mr. Mosher—I have bought them for forty-three cents with seven inches face.

President—Mr. Stone.

Mr. Stone—I did not come here to speak so much as to hear. I have had the buying of the ties on the second division of the Boston & Albany, where we get more ties, probably, than on any other division on the whole road. For the last two or three years I have inspected between 150 to 250 thousand ties each year. We have had no trouble in getting ties, could get all the ties we wanted. We don't get as good ties as we want or would like. I think if we could get ties that are nearer eight feet long we could get a great deal better tie. One trouble with the ties that we have had is that they put in so many small ties that you have to throw out; some are over eight feet and a half, some seven feet and a half, and some nine feet. I think our specifications ought to specify having them sawed off square on both ends. It is just as easy for a man to saw the ties eight feet as eight feet and a half, when you only want eight. Within the last year we have got so many ties that we have had to begin to hold back a little, and we don't intend to buy a very great many more this year, no more than we possibly have to take. I think that we could get better ties if we were more particular and would not take everything that comes in.

President—Mr. French, do I understand this motion before the house to include only a first-class tie, don't recommend anything but a first-class tie?

Mr. French—This is for a standard first-class tie.

President—That is the way I understood; but I thought some seemed to entertain the idea that you did not buy anything but that, and it would prevent us from getting number one ties because we did not take any number two.

Mr. Mosher—I didn't so understand Mr. French. I think his idea of first-class ties is the best one. Still I should not want to buy one-quarter of my ties six inches.

Mr. W. E. Clark—As I understand that question, we decide what should be a standard tie, and it has nothing to do with the number of cull ties we take, that each road can do as it has a mind to. What we want to get at is a standard tie, and for that reason we ought to have those dimensions recommended. Each Roadmaster can buy as many cull ties and undersized ties as he needs.

President—And at any price he chooses.

Mr. W. E. Clark—And pay the price that he can get them for in his locality. We cannot decide the price, and what each gentleman needs for side tracks. Your purchase has to be governed by the quantity needed. But we recommend that size for a standard, first quality tie; you can make a second quality if you wish.

President—This matter is apparently plain now, and we can act understandingly. Is there anything further to be said upon this motion?

Mr. J. S. Lane—I would like to ask Mr. Clark if he has ever found any objection to the 7-inch ties that he placed in the Housatonic road?

Mr. F. C. Clark—No, sir, I don't object to a 7-inch tie by any means.

Mr. J. S. Lane—When I first advanced the thickness to seven inches on my road the Roadmaster at first insisted that a 7-inch tie would not work with a 6-inch at all, they must all be six inches or they must all be seven inches. I brought up the argument then, you put in a 6-inch tie, it wears down three-quarters of an inch, and what do you do with that? It is a good tie, a spike has never been pulled and re-driven, it is not cut up bad—do you throw that out because it is only five inches or five and a quarter? They said, no. So I said, "Where is your inch then? If seven and six won't work together, why not throw out all the five inch ones, no matter how good they are, when you come down to that point?" I was buying when I resigned all the 7-inch ties I could. I think in several meetings that objection was brought up to placing 7-inch ties under a road with 6-inch ties in between ; but I never have been able to find any objection; if the others have I should like to hear it.

Mr. F. C. Clark—I want to say one word: I don't see the necessity of putting into this motion anything in connection with the number of 6-inch ties that any individual member of this Association shall purchase, if it is only six inches thick, with all deference to Mr. Mosher. We are simply here to discuss this question, and to say what we believe is the best tie for a standard tie. If we say that seven inches is the standard, is the best tie, let each member—as a namesake of mine has well said in regard to ties of six inches face as well as in regard to cull ties —let each member decide for himself just what he is compelled to take in order to keep up the quality of ties, if it becomes a necessity. But when we as one man stand up here and declare that we believe that a 7-inch tie is better than a 6-inch, as we do say, and if we can have a uniformity in our inspections, if we could have a uniform standard that prevailed all over the roads, it would prevent any competition. Mr. Mosher would not be down in my territory purchasing ties, or I won't be on his, although I don't claim to have been a very great sinner in this respect. But there is this one thing that I would like to ask, to get at this point clearly: Take a stick of timber that will make a tie with a face of 6½ inches, if sawed to six inches in thickness. Take that same stick of timber, and saw it seven inches in thickness, and you have, perhaps, 5½ inches face; we will suppose that would be the difference, it would be not far from that. Now, you have a number of ties in a stick of timber with the 5½ inch face or the same stick of timber sawed so that you have a 6½ inch face, the surface bearing of your rail. I claim, and adhere to it, that where you have the narrow face of the tie up—until we have got further on in these matters, and get a rail just such as we all want, that it is going to stand up, for we are not here to prescribe ties for the purpose of building pontoon bridges over water, but ties laid on good ground—the first half inch goes a great deal the fastest. That is the reason why I claim a benefit. Now, I have seen as deleterious results from 7½ inches as has ever been laid to 6½ inches, and where you have got good gravel you would never know the difference. But I do believe, if we can get them, if by union of effort or union of thought we can get seven inches thickness, with the proper amount of face to support our rail, we can have firmer and better track, and keep it better.

Mr. French—Question.

President—The question is called for. The motion before the house is, that the standard tie recommended by this Association shall be eight feet long, seven inches thick, and six or more inches face. All in favor of this motion will please manifest it by the usual sign of this convention, the uplifted hand.

The motion was declared carried.

### REVIEW OF PREVIOUS YEARS' DISCUSSIONS.

President—The next article, and the last, is "Review of previous years' discussions." Mr. Lane is chairman of that committee, and will now present his report.

Mr. J. S. Lane—I will say that after I received notice that I was on this committee I talked with Mr. Post, who is on the Hartford division where I used to be. He is the only one that I have talked with. The others were not here, and I was not able to have any conference with them. There are none of the committee here. So that I wrote out a few thoughts, and will present them as my own, as chairman of the committee, of course not as those of the committee, because I have not been able to get them together:

Your committee on "Review of Subjects" which have been discussed in the past, have not been able to meet since the assignment of the subject, and only one is present. The subject is almost unlimited. We, and the companies represented, cannot but acknowledge the great practical results of these annual meetings. Although we sometimes differ very much in our opinions, and honestly, yet as we have met from year to year to compare results, no one can fail to see a greater uniformity in opinions resulting from these discussions. The time and manner of doing the various kinds of work, has been discussed, which has resulted in great economy in labor and material. Improved material of all kinds used for repairs has been discussed. In this manner, one road derives the benefit of another's trial and experience, as many devices are condemned and no worthless ones recommended. In this way only could such rapid advancement have been made, with safety to the traveling public and economy to railroad companies.

Not the least of all the advantages of these meetings have been the different devices brought together by the Supply Men,—the many different experiments tried,—and much money has been saved railroad companies by trials made at the expense of these men or the manufactories they represent.

The improved Automatic Switch Stand has been attached to a split switch. Improved Rail Frogs have replaced the rigid cast-iron ones, and other styles, so that now broken wheels and journals, on passenger trains, at least, are almost unknown.

Nut Locks and other improvements for rail joints. The Rail Saw, which cuts the rail and leaves the end perfect as before. The Servis Tie Plate, which has now come to stay, making the life of ties, especially on heavy traffic roads, more than double. The use of light hand-cars resulting in a great economy of labor. All these, and many more, are the results from which we and the railroad companies we represent have been benefitted by the introduction of these devices at our meetings.

The fact of the difference of gauge that existed in car wheels up to within a few years, attention to which has been called by the discussions in our meetings, has for the most part been remedied.

One more subject which has been much discussed in former years is the Elevation of Curves. which has now become much more uniform than then, and with improved results, and I would like to hear from members present, objections and additional benefits. These are only my personal views.

On motion of Mr. Hyland, seconded by Mr. F. C. Clark, the report was accepted for discussion.

President—The subjects touched upon in this report are now under discussion. You will proceed to discuss each and every article mentioned here that you see fit.

Mr. J. W. Shanks—If it would be in order, I would make a motion, and that is, that we adopt this report as the sense of this convention, and put it upon record as such.

The motion was seconded by Mr. F. C. Clark and carried.

President—Is there any miscellaneous business before us at this time?

Mr. F. C. Clark—Mr. President, I wish to call attention to the resolution presented by Mr. Ellis and passed at the last meeting, which reads as follows: "That all members will in any experiments which they may try for the improvement of track or saving of labor or material in their work give the results of such experiments for the benefit of the Association at each meeting." If in order, I would ask the convention through you, Mr. President, if there are any reports of that character to be presented.

President—Will the members please inform Mr. Clark if any such reports are in readiness ?

Mr. F. C. Clark—I refer, Mr. President, of course, to those matters which have not been touched upon in our regular discussion of the questions or resolutions which have passed before ; any railroad appliance, whether it is any particular joint, nut lock, or anything of that kind, which any of our Roadmasters have tried, and formed an opinion upon, so that they can enlighten us in regard to their finding in the matter.

President—If any member has anything to present under this resolution, it will be proper to do it at this time.

Mr. J. S. Lane—One article I have in mind, that is the Servis Tie Plate. At the time that first came out I made up my mind that it was a valuable invention. I procured some of them at once, as soon as I could, and put them on, and they gave good results. Last year on the division I was on we used 2,000 more of them, and I was informed a few days ago that they had just ordered 10,000 more, which is a very interesting beginning. I will speak of that one thing in particular ; not that I am interested in any way, only it is just as we agreed to do.

Mr. F. C. Clark—I would like to ask Mr. Lane if he used the Servis Tie Plate himself ?

Mr. J. S. Lane—I have had them in use two years. I took up the track on which they were laid, and used the ties in another place. The first 200 I used on the inside of curves, put nothing on the outside. After running a year I took those ties out, had occasion to remove the ties to another point, they having been cut down on the under side. The plates came off, and not a mark on the ties where the plates rested, except the flanges of the plate set down into the tie. On the opposite end, where the rail rested on the tie only, it was worn down from an eighth to a quarter of an inch, where there was no plate. On the end where the plate was, in no case had the plate set down into the tie a particle, except the flange.

Mr. F. C. Clark—I would like to ask if you used 4¾ or six inch ?

Mr. J. S. Lane—4¾. We have not got up to the six inch yet.

Mr. F. C. Clark—Through you, Mr. President, I would like to ask if there are any other members present who have used any Servis Tie Plate, and are able to give us something in regard to their findings in the matter. I believe all over New England the roads we represent want to know the findings in this matter. Theory sometimes is not the thing experienced, and, again, practice sometimes proves it to be correct.

President—I presume there are other members who have had some experience with the Servis Tie Plate, if they would only give us their experience.

Mr. F. C. Clark—If there is nothing I would make this motion: That we each, if practicable, procure a sufficient number of the Servis Tie Plates to put them in use, and each be prepared at our next annual meeting to state our opinion of the value of the Servis Tie Plate in railroad work.

Mr. J. S. Lane—Further with regard to the Servis Tie Plate ; if I remember right, at the superintendent's last meeting they adopted the Servis Tie Plate, for a bridge floor, at least, to preserve long ties from being cut into. If good for a bridge floor they are good for the inside of curves, where I have used them, and where for a year they held the rail as fast as when first laid.

Mr. F. C. Clark—That is very good, Mr. Lane; I would like to know that ; but we want to know from practice or experience just what they are. You may believe them good and first-class. We have talked long about the frog, the spring rail and the rigid frogs, and by experience and by experiment we have pushed those matters along towards perfection, and we want in all departments and in all branches connected with railroad work, to push our inventions and our experiments in the same direction towards perfection. Now, then, if we are not prepared to say, I say let us try, and therefore I make the motion that we procure and use, to an extent that will satisfy us, the Servis Tie Plate, and be prepared to report at our next convention.

The motion was seconded by Mr. Patch and carried.

President—Is there further business to come before us?

Mr. F. C. Clark—There is one more resolution that I would offer: That the executive committee be authorized to appoint a committee of three to make a report on each question to be presented and discussed at our next meeting.

The motion was seconded by Mr. French and carried.

President—Is there anything further to come before this? convention?

Mr. French—In addition to the resolutions already presented I wish to offer the following:

*Resolved*, That it is the sense of this convention that to have a successful meeting it is essential to have all the appliances and devices that supply firms can conveniently send, and we are very grateful to the firms which have thus sent representatives and devices and extend to them a hearty welcome to our next annual meeting, as well as to other firms which are not represented here this year. Adopted.

*Resolved*, That we express our thanks and appreciation for the courtesy extended by the Fitchburg Railroad Co., through its Chief Engineer, Mr. E. K. Turner, inviting the members to an excursion over their road to the Hoosac Tunnel. Adopted.

*Resolved*, That we express our thanks to the proprietors of the American House for the many privileges granted us during this meeting. Adopted.

*Resolved*, That a vote of thanks be extended to all Railroad officials for any courtesies extended to any member of this Association. Adopted.

At a later meeting the following resolution was adopted:

*Resolved*, That a special vote of thanks be tendered Mr. J. Frank Adams, Div. Supt. Fitchburg R. R., for his untiring efforts to make our trip to the Hoosac Tunnel a most pleasant and instructive one.

Mr. J. W. Shanks—It strikes me that we have done considerable work, and now I would move you that we adjourn, to meet on the third Wednesday of August, 1891, in Boston.

Motion seconded by Mr. W. E. Clark.

President—You will now give your attention to the closing prayer by the Chaplain.

Prayer by the Chaplain, Mr. Horner.

Our Heavenly Father, we return thanks that Thou hast revealed Thyself to the children of men through Thy word and through our own consciousness, and we pray Thee that we may trust Thee, that we may each walk before Thee realizing that our lives are in Thy hand, that Thou art the Author of wisdom, Thou art the Author of every quality that we so much need in every duty of life, and especially in the responsibilities and the necessities and the duties that fall to our lot. We pray that we may each realize our responsibilities and our capabilities, and that we may each in fidelity and in earnest and faithful activity discharge our obligations, and do that which belongs to us to do, to increase the safety on the highways of our land; and we pray that the corporations which we represent may be guided graciously and divinely, and that the improvements which we have begun to see may be continued and increased until there shall be improvement, permanent, solid improvement, on every hand, and that it shall be a real gain to the people, and to the owners, the managers, and the directors on all these ways ; and may we so live and so walk and so work that we shall commend ourselves to these, and to the people whom we serve, and to our own best judgment. Keep us as we separate, and bless and prosper us in the future as Thou hast in the past, and even more abundantly, if it please Thee, for the Redeemer's sake. Amen.

# MEMBERS.

| | | |
|---|---|---|
| Beane, A. C. | C. V. R. R., | St. Albans, Vt. |
| †Bishop, G. W. | F. R. R., | Athol, Mass. |
| †Bodwell, S. B. Jr. | B. & M. R. R., | Lowell, Mass. |
| †*Braley, B. A. | O. C. R. R., | Bridgewater, Mass. |
| †Brennan, P. D. | N. P. R. R., | Peacedale, R. I. |
| Bryant, E. H. | O. C. R. R., | New Bedford, Mass. |
| †Clark, F. C. | H. R. R., | Falls Village, Conn. |
| †Clark, W. E. | V. V. R. R., | Charlestown, N. H. |
| †Collins, R. P. | O. C. R. R., | Readville, Mass. |
| Daggett, G. E. | N. Y., N. H & H. R. R., | Stamford, Ct. |
| Day, J. F. | B. & L. R. R., | Colchester, Vt. |
| †*Dearborn, W. L. | B. & M. R. R., | Boston, Mass. |
| Dearden, W. F. | G. T. R. R., | Richmond, P. Q. |
| †Dickey, T. J. | F. R. R., | Boston, Mass. |
| †*Drew, J. W. | O. C. R. R., | Hyannis, Mass. |
| †Ellis, W. F. | | Woonsocket, R. I. |
| †Follansbee, G. H. | C. R. R., | Keene, N. H. |
| †French, G. L. R. | B. & M. R. R., | Northampton, Mass. |
| Garrison, D. C. | S. L. & N. R. R., | Roxbury, Conn. |
| †*Greer, Sam'l | N. Y., N. H. & H. R. R., | Westfield, Mass. |
| Hammond, H. N. | N. Y. & N. E. R. R., | Providence, R. I. |
| †*Holbrook, F. | N. Y., N. H. & H. R. R., | Stamford, Ct. |
| †Horner, E. W. | C. V. R. R., | Rutland, Vt. |
| †Hutchinson, Wm. | B. & M. R. R., | Nashua, N. H. |
| †Hyland, R. | C. R. R., | Keene, N. H. |
| †*Jackman, E. E. | B. & M. R. R., | Franklin, N. H. |
| Keenan, Jas. | C. N. E. & W. R. R., | W. Winsted, Ct. |

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†Members Present.

*New Members.

| | | |
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| Lane, C. S. | N.Y.,N.H. & H.R.R., | Waterbury, Ct. |
| †Lane, J. S. | " | Hartford, Ct. |
| †Lavoix, Chas. | B., R. B. & L., | Winthrop Junc., E. Boston, Mass. |
| Leach, H. S. | C. V. R. R., | Malone, N. Y. |
| †Lentell, C. B. | B. & A. R. R., | Boston, Mass. |
| *Letchworth, Sam'l | N. Y. & N. E. R. R., | Boston, Mass. |
| Loomis, E. R., | N. Y., N. H. & H. R. R., | Hartford, Ct. |
| Ludwig, W. B. | W. R. R., | Waldoboro, Me. |
| †Lydston, E. W. | B. & M. R. R., | Lawrence, Mass. |
| †McManama, J. W. | F. R. R., | North Adams, Mass. |
| Merrill, W. H. | C. N. E. & W. R. R., | Rhinecliff, N. Y. |
| †Morrill, E. | B. & M. R. R., | Lawrence, Mass. |
| †Mosher, W. T. | B. & A. R. R., | Boston, Mass. |
| Nevens, Geo. | M. C. R. R., | Brunswick, Me. |
| †Patch, J. R. | C. R. R. R., | Springfield, Mass. |
| Paxson, S. C. | N.Y.,N.H. & H.R.R., | Westfield, Mass. |
| †*Perkins, P. S. | N. Y., P. & B. R. R., | Providence, R. I. |
| Phillips, H. A. | | Boston, Mass. |
| Post, E. K. | N. Y., N. H. & H. R. R., | Hartford, Ct. |
| Sargent, F. M. | O. C. R. R., | So. Framingham, Mass. |
| †Shanks, J. L. | F. R. R., | Johnsonville, N. Y. |
| †Shanks, J. W. | N. L. N. R. R., | Palmer, Mass. |
| †*Sibley, F. E. | N.Y.,N.H. & H.R.R., | Middletown, Ct. |
| Slafter, C. S. | O. C. R. R., | Readville, Mass. |
| †Spaulding, L. J. | F. R. R., | Ayer Junc., Mass. |
| Stevens A. C. | B. & M. R. R., | Beverley, Mass. |
| †Stickney, A. C. | B. & M. R. R., | Boston, Mass. |
| †*Stone, E. E. | B. & A. R. R., | Springfield, Mass. |
| Toomey, D. | N. Y. & N. E., | Norwich, Conn. |
| †*Torr, Jas. M. | N. Y., P. & B. R. R., | Woonsocket, R.I. |
| †Woodworth, A. C. | N. Y. & N. E. R. R., | Willimantic, Ct. |

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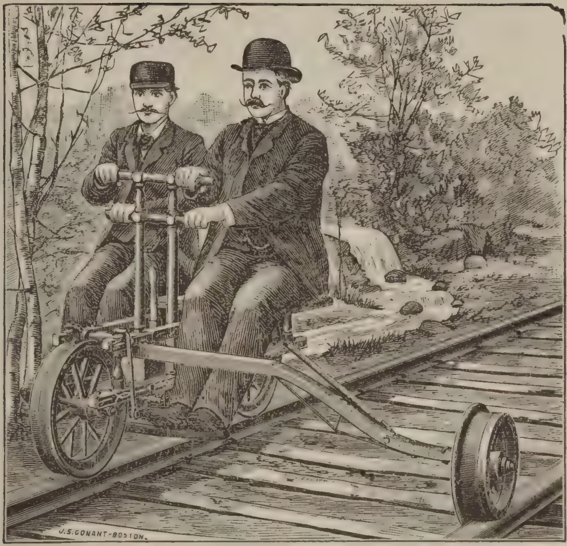
†Members Present.

*New Members.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Bangor & Piscataquis Railroad,
Office Roadmaster, Oldtown, Maine.

Sheffield Velocipede Car Co., Three Rivers, Mich.

Dear Sirs: — I am glad to say that I have twelve of your Velocipede Cars on the road, some of which have been in use five years; they have given entire satisfaction. We use them on the sections and find them very convenient when it is necessary for one or two men to go over the road for any purpose.

Yours truly, John Farquhar, R. M.

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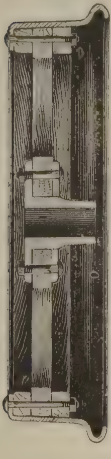
Michigan Central Railroad Co.,
Chief Engineer's Office, Detroit, Mich.

E. B. Linsley, Esq., Sec'r Sheffield Velocipede Car Co.

Dear Sir: — The Assistant Road Master on my division on the N. Y., W. S. & B. R. R. used your Velocipedes to inspect track; but I believe that where the road bed is reasonably good, that one man and foreman with the assistance of a velocipede car could attend to the shimming in the winter season, provided they were furnished with shims ready made.

I also think they would be equally labor saving in the other seasons of the year, as one man could inspect the track on each section, leaving the balance of the men at work on repairs, and after going over the section could put in about three-fourths of a day's work with the gang.

Yours truly, M. J. Griffin, Assistant Engineer.



[Our Standard Wood Centre Hand Car Wheel, with Steel, Tire and Drop-Forged Steel Hub.]

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By late improvement the Flange on all Velocipede Wheels is turned over, as shown in cut of our Standard Hand Car Wheel in margin, thus making tread conform strictly to M. C. B. standard, and avoiding the difficulty found with thin flange heretofore used.

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The Three Rivers

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*Measures Track Sidings and Ballast.*

*LOCATES CROSSINGS*

**Whistle Posts,**

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**More Accurately than can be done in any other way and with Half the Expense.**

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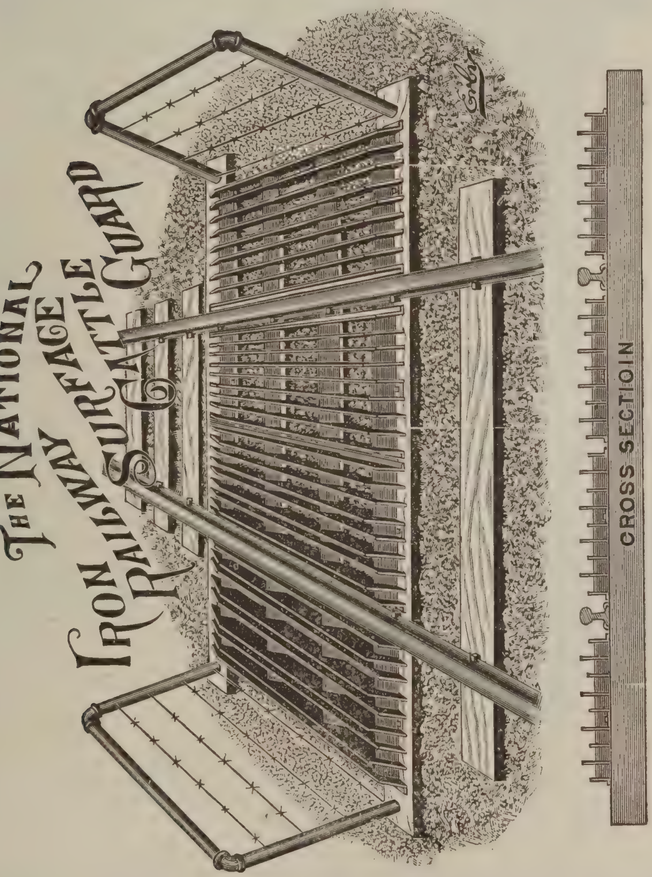
# OVER 7,000

**In Use on 150 Railroads Since March 1, 1888.**

*The Most Economical, Safe and Durable Guard in Existence.*

**Continuous, Ballasted Track. Satisfaction Guaranteed.**

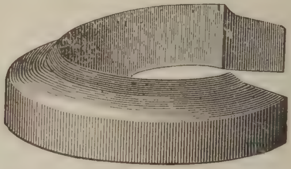

The National
Iron Railway Surface Cattle Guard
CROSS SECTIOIN

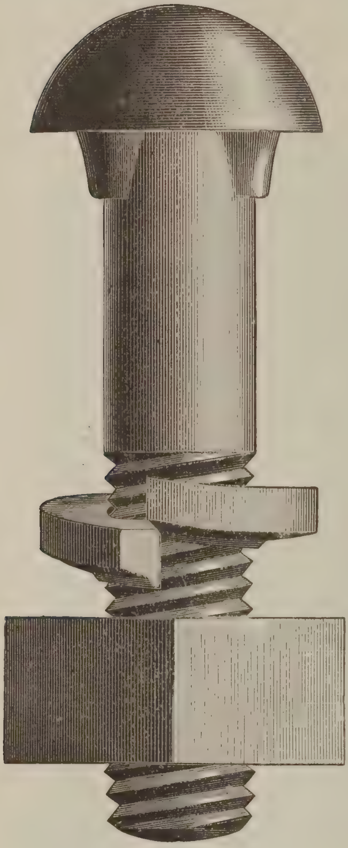
THE NATIONAL SURFACE GUARD COMPANY,

**234 S. Clark St., CHICAGO.**

## THE NATIONAL

# LOCK WASHER!





## SIMPLE, EASILY APPLIED.

Combining Strongest Spring Fastening possible, with positive locking of Nut by **rib.**

Can be used on any make of bolt or nut, in any place in track.

Same bolt, nut and washer can be used as **often as required.**

**The National Lock Washer** is made of steel, hardened and tempered in oil; when in use in track the rib is imbedded in nut (does not cut out metal in nut), thereby upsetting metal of nut and forcing it around bolt, and so locking nut that it cannot jar loose, acting at same time it has all the spring-holding power of the best spring nut lock made.

A trial of the **National Lock Washer** is requested, as actual use will demonstrate its superiority

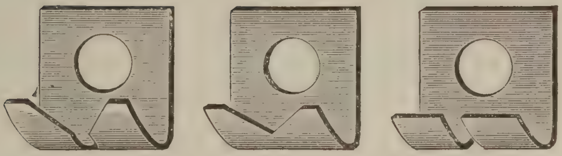
**Samples Furnished Free of Expense.**

## The National Lock Washer Co.,

**93 Mechanic Street, NEWARK, N. J.**

The Coming Nut-Lock!

OF THE FUTURE.



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*FITS ALL BOLTS AND NUTS.*

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ROOM 7, - KLINE BUILDING,

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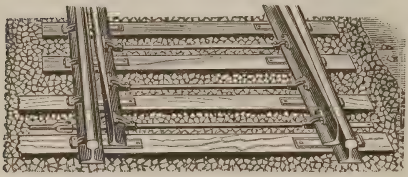

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AND

## Lorenz Safety Switches

WITH

*Interchangeable Parts.*

Unsurpassed Workmanship & Fit.

Having unequalled facilities for their production, either for quantities or qualities, invite attention thereto. Have six different (standard) patterns of construction, suited to all requirements, and make several other patterns (on specifications). Imitations of our patented special patterns are extant, of which the public are warned. Slide plates or friction plates are Steel, and Braces of Wrought Steel ; both, combined, make the *Ideal Switch Plate.* Switch points fitted as required, and elevated as in Clark-Jeffery Switch when required.

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Operated wholly by one-hand Lever. Wherever it is necessary to retain three-throw switches this improvement should be used. It is justly regarded as the most satisfactory three-throw arrangement on the market.

## IMPROVED PATTERNS OF SWITCH STANDS.

Wrought Steel Guard Rail Braces.

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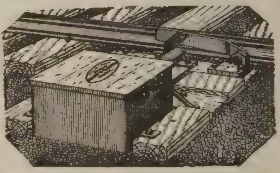
*Efficiently and Acceptably Protects the Public from Accident.*

By an unmistakable warning of the approach of every train, of such vigor as to arouse the attention of the most unwary. Acts only by approach of train or engine. Gives no false alarms. Obviates employment of Watchmen, at great saving in expense.



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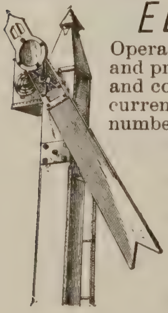
Only as required, by passage of train over track levers of substantial Magneto Generators fitted in strong iron cases alongside the tracks and at required distance from crossing. As no cup batteries are used there is no freezing up in winter, nor running out of battery power. Action of Alarm incomparably better, quicker and louder than any other electric signal.

Requires only lubrication, and some little attention to condition of working parts at intervals.



## *ELECTRIC SEMAPHORE SIGNALS,*

Operate at any required distance under eight miles with certainty and precision. Useful at all points where trains are to be signalled and controlled from a distance. Movement of signal effected by currents from magneto machines, which will operate any required number of Semaphores from the one station. Action of each Semaphore always known to operator, however distant. Semaphore is full size, mounted out doors on regular posts. Valuable addition to the signals of any station, and especially useful at junctions or other points where trains arrive from various directions.

For particulars and prices of Frogs, Switches and Signals,

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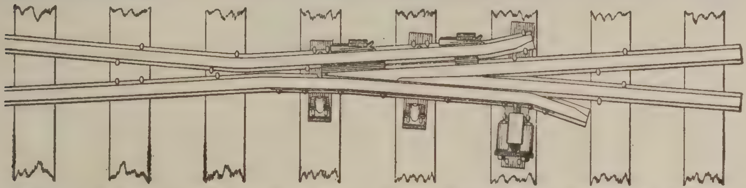
*Of all patterns, from 12 pounds per yd to heaviest patterns made.*

STEEL SPLICES AND FASTENINGS.

## Spring Rail Frog, Keyed Pattern, Improved.



This Spring Rail Frog excels all others in Safety, Strength and Durability, Noiselessness and convenience of placing and maintenance ; and in main line tracks is the most economical Frog that can be used. The fixed parts are bound inside of strong clamps, which are so immovably secured, are much stronger than any other mode of fastening the parts, and may always be tightened, as parts wear, to keep everything snug and solid, and avoid rattling. The spring rail is guided and kept in place by the strongest and most efficient devices in use, the spring rail being strengthened and secured against breaking. The peculiar form of the spring rail provides for all conditions of wheels the most secure bearing and support ever attained in Spring Frogs.

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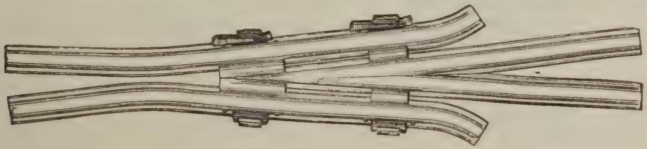

The **PATENT KEYED PATTERN STIFF** Frog continues the favorite Rigid Frog, and is sold more extensively than any other pattern of Rigid Frog. It is of the strongest possible construction, simple and reliable, easy to place and keep in condition to obtain the utmost durability of the steel rails of which it is made.

## Stiff Frogs, of Various Riveted Plate, and Bolted Patterns

Are also supplied to many roads, and our facilities for making them, at favorable prices, are not surpassed. Various methods of fitting, as preferred.

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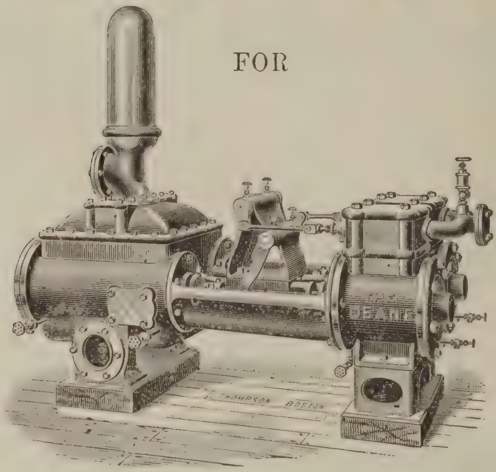

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*A Tempered Cast Steel Spring, with Smooth Bearing Surfaces and Hardened Engaging Points,*

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Takes up Wear. Locks the Nut. Quality fully maintained.

We have sold over 15,000,000 for this year, from Jan. 1st, '90, to Jan. 1st, '91, making our sales to date, Jan. 1st, '91, over 175,000,000. We are keeping up the quality of steel in their manufacture, which insures a Perfect and Reliable Nut Lock. We think the sales of the Nut Locks show their preference over all others.

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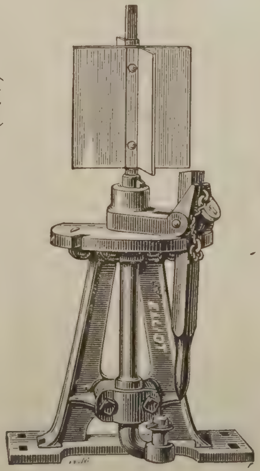

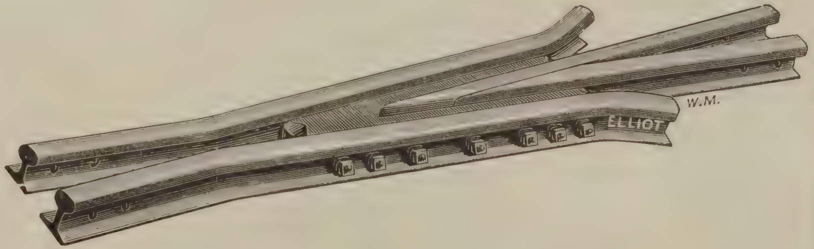

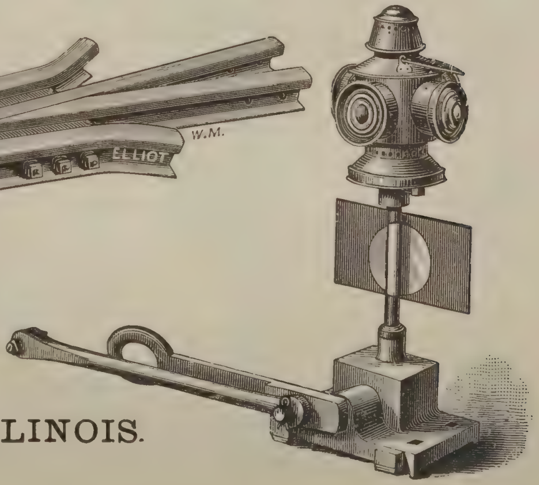

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*R. R. Frogs, Crossings, Switches*

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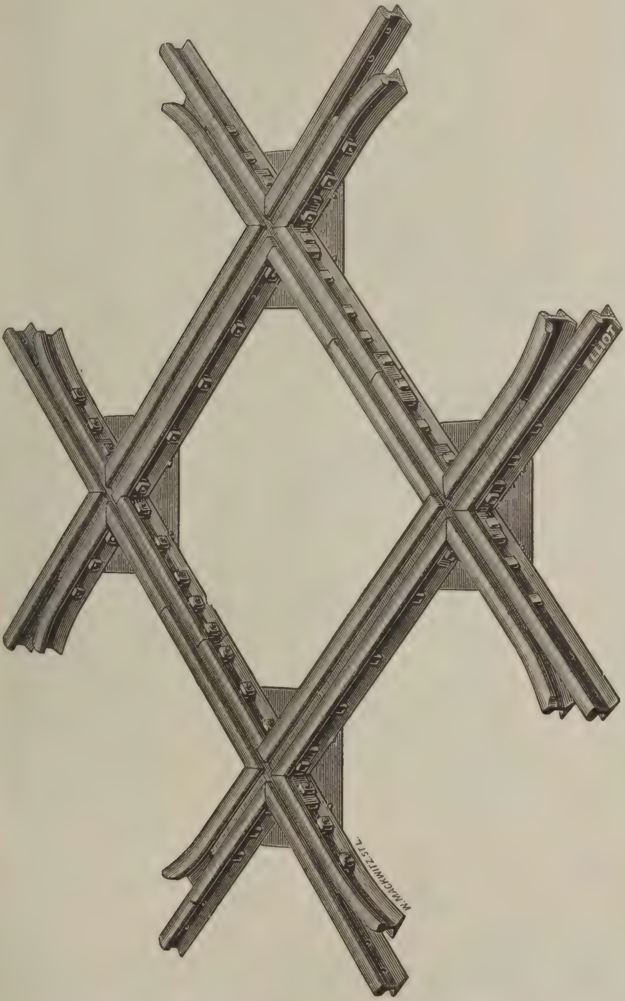

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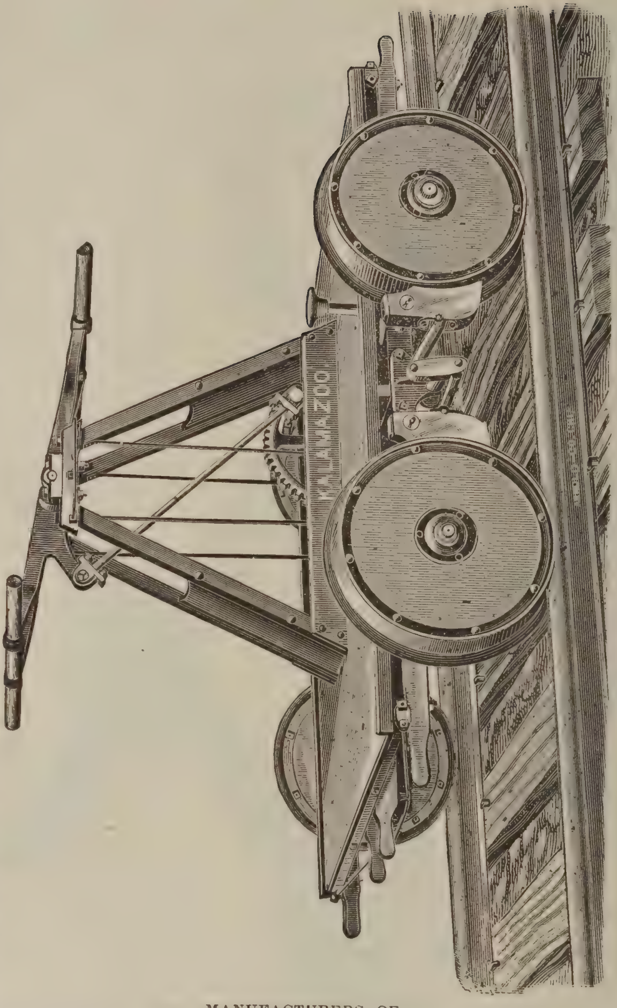

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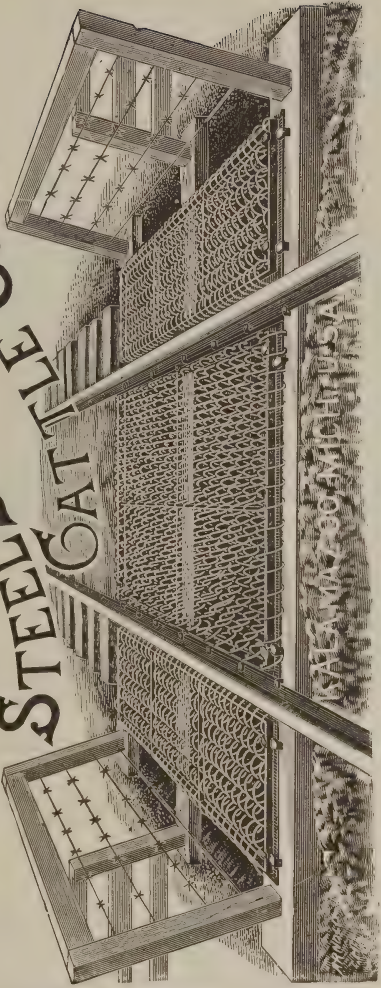
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ACCIDENTS from TRACK SPREADING PREVENTED.

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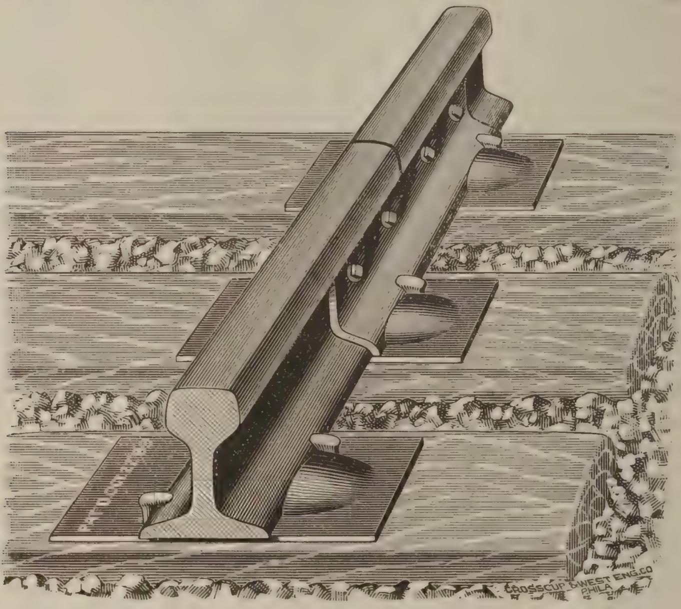
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THE SHOULDER TIE PLATE not only makes the track safer, but the greater part of the expense now found necessary for NEW SPIKES and REGAUGING AND SPIKING can be saved by the small outlay in the first place due to the cost of the plate.

The rail bearing against the shoulder brings into use the inside as well as the outside of spike, doubles the present resistance to lateral thrust and thus effectually prevents spreading of the track.

The spike hole on the outside of the plate, being offset from the line of the shoulder, prevents the spikes from being worn under the head by contact with the edge of the rail base.

The plates will be punched with two spike holes on the outside, or side of the shoulder, when specially ordered.

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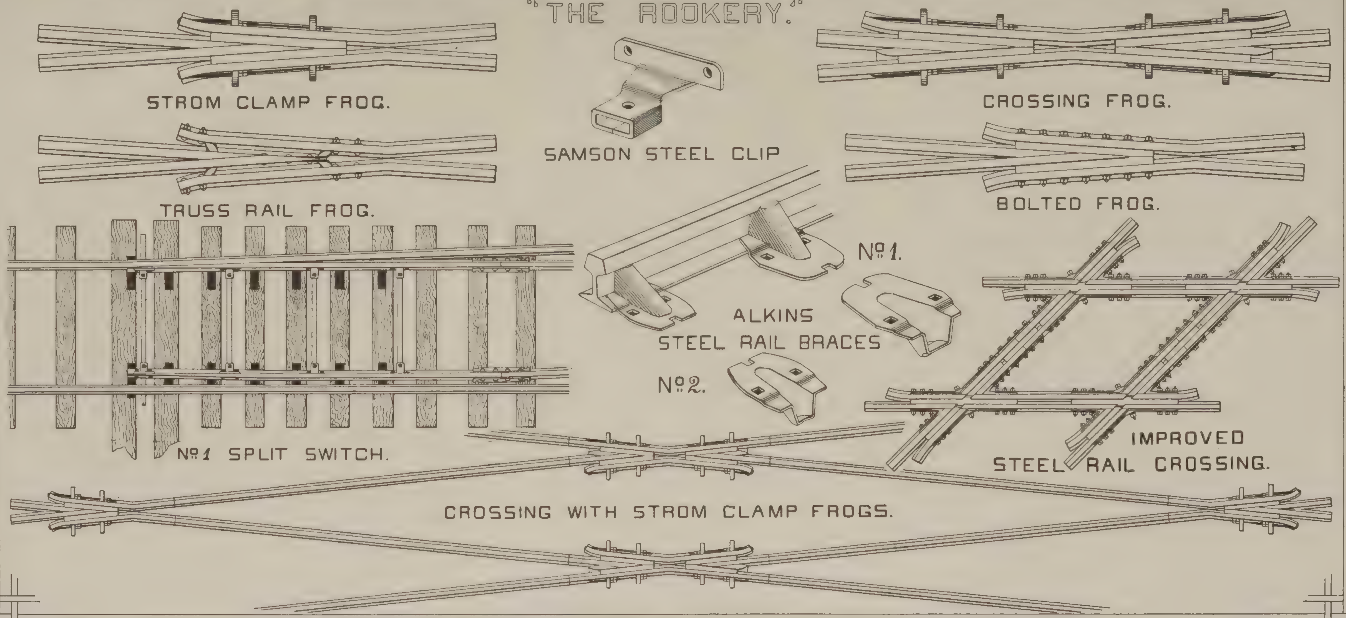

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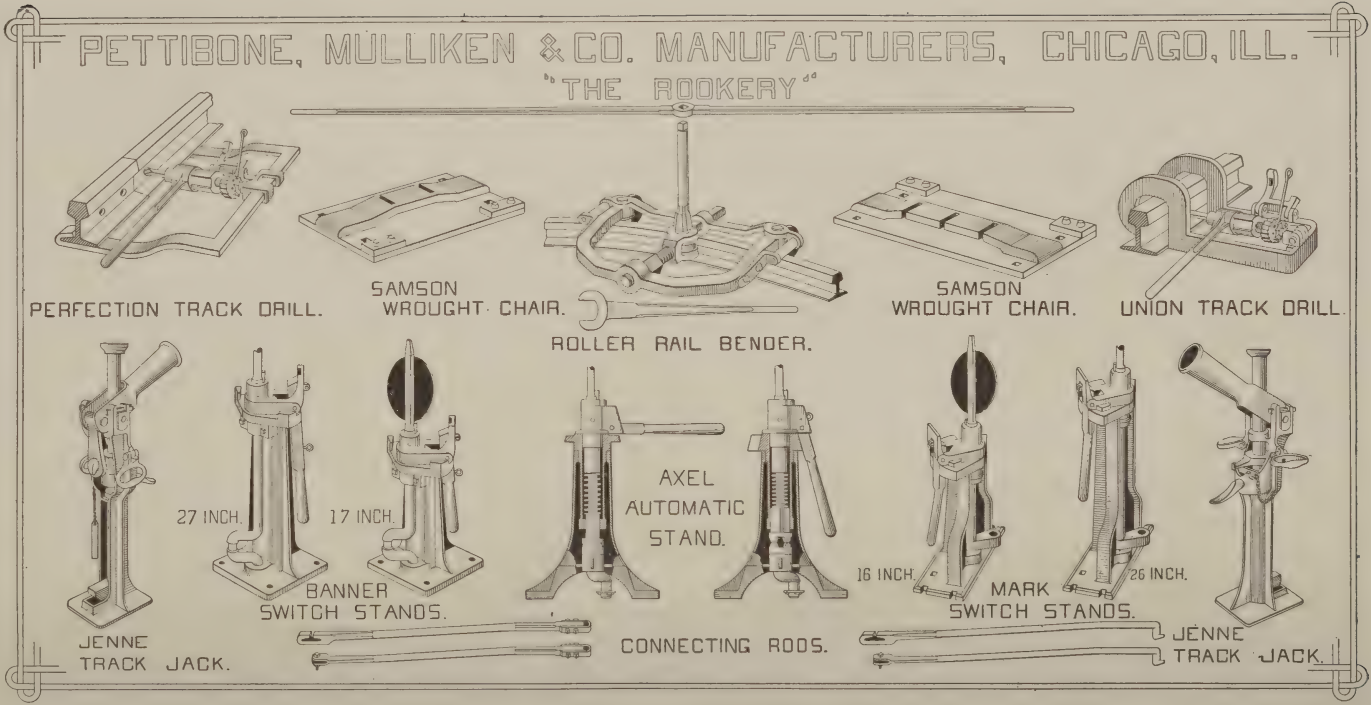
Nº2.

Nº1 SPLIT SWITCH.

IMPROVED STEEL RAIL CROSSING.

CROSSING WITH STROM CLAMP FROGS.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Who require for their track work a

TRACK JACK

COMBINING THE ADVANTAGES OF

**Durability,**

**Power,**

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**AND**

**Instantaneous Trip.**

Will find all these points combined perfectly in our Nos. 38 and 39 Grip Track Jacks, as here illustrated.

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The Noble Washer!

—FOR—

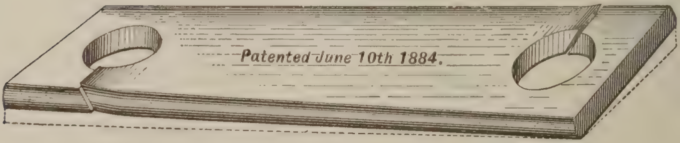
TRACK JOINTS,

*Manufactured and Sold by*

*The A. FRENCH SPRING CO.,*

(LIMITED.)

PITTSBURG, PA.



Made of 1½ in. x ¼ in., and 1¾ in. x ¼ in. Steel, with hole centres to order.

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*—This Washer is Presented on Its Merits.—*

☞ SEE OPPOSITE PAGE.

# The Noble Washer.

As the best and cheapest for securing track joints. It is a torsional spring, made of good quality of spring steel 1½ in. x ¼., and 1¾ in. x ¼ in. The average length Washer gives a tension of 5700 pounds on each bolt. THIS IS APPROXIMATELY THE SAFE LIMIT OF A ¾ TRACK BOLT AT THE ROOT OF THE THREAD, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on rails, seating and giving them a bearing their full length, on the principle that "the nearer a perfect fit of the parts, the less the wear."

It can be used on a four or six bolted joint, having holes varying in length from 4 to 10 inches from centre to centre.

This Washer has sufficient elasticity and stiffness to maintain a permanent tight joint, with the least possible amount of labor being required to tighten bolts. Joints equipped with them will not rattle.

Notwithstanding it is a positive nut-lock (the slit at hole securing the nut at any part of its turn automatically) no special merit is claimed for this feature. Joints do not get loose on account of nuts rotating back ; it is caused by wear of the bearing surfaces. This must be reduced by seating the angle plates to the rail.

A positive nut-lock, without elasticity, is of no value ; the tension must exceed 3000 pounds per bolt to do the work.

**Correspondence and trial orders solicited.**

**Samples sent free.**

**ST. LOUIS.**

**BLACKMER & POST,**

*MANUFACTURERS OF*

SUPERIOR VITRIFIED SALT-GLAZED

**Standard Sewer Pipe**

—AND—

**Double Strength Culvert Pipe,**

In Two and One-Half Foot Sections with Improved Sockets.

—FOR—

**RAILROAD CULVERTS & WATER WORKS CONDUITS**

*Write for Pamphlet, "Something About Culvert Pipe."*

**BLACKMER & POST,**

**ST. LOUIS.**

Wm. J. Watson, Pres't,
Chicago.

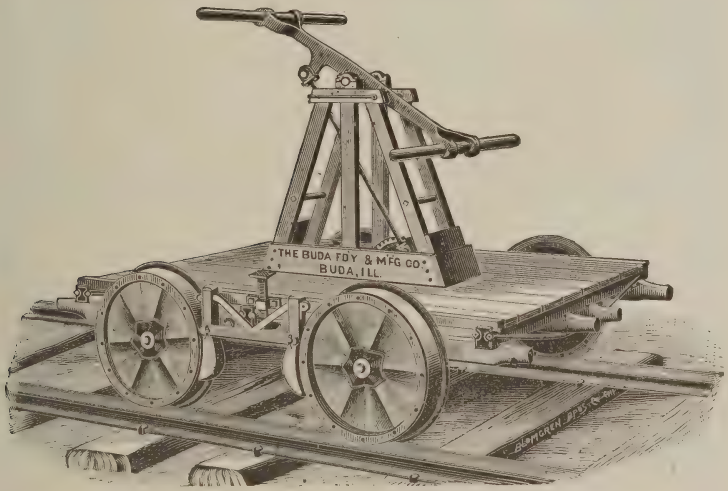
Chas. C. Shepard, Sec. and Treas.,
Buda, Ill.

# The Buda Foundry and Manufacturing Co.

MANUFACTURERS OF

## WOOD WHEEL
## Hand and Push Cars

WITH ROLLED STEEL TIRES.


THE BUDA FDY & MFG CO.
BUDA, ILL.
BLOMGREN BROS & CO CHI

*Railway Supplies,*
*Switch Stands,*
*Steel Switch Chairs,*
*Switch Fixtures.*

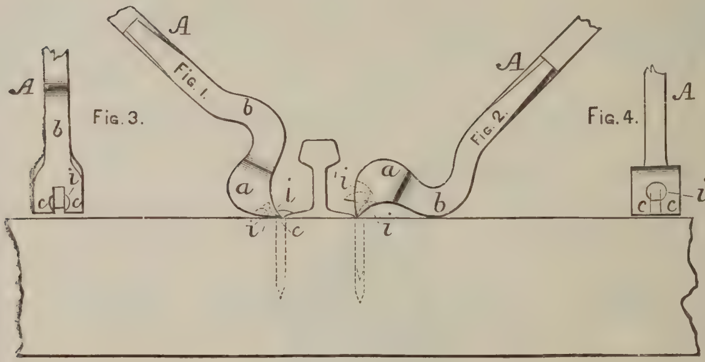
Chicago Office,
Room 607, 138 Jackson St.

General Office and Works,
Buda, Ill.

**CHAS. M. HEWITT, General Agent, CHICAGO.**

## HAMM'S

# SPIKE PULLER.



*Office and Works:*

**HILLBURN, Rockland Co., N. Y.**

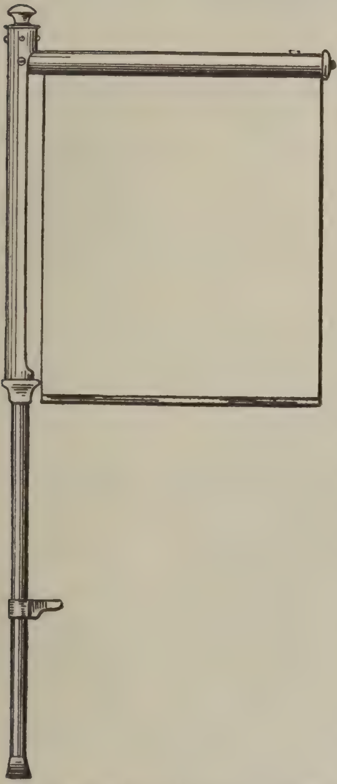
*Telegraph Station,*

**RAMAPO, N. Y.**

# TALLMAN'S

NEW AND IMPROVED

# Flag ∴ Signal ∴ Holder.



Holder with Flag Displayed.

The accompanying Cuts represent the new Flag Holder which we are now prepared to furnish railroads for use of track and bridge foremen, or at any place where flag signal is used.

**It Will not Wear Out!**
**Keeps the Flag Clean!**
**Holds it Always in Position!**

The entire holder is made of metal; the arm, to which the flag is attached, and the case into which the arm is dropped when signal is not in use, being made of galvanized iron, and the staff of iron pipe. The case and arm are neatly painted to correspond with the color of the flag that they hold. The holder is strongly made in every part and cannot be blown down.

*The Flag cannot become torn, soiled or discolored while being carried on hand car, as it is completely protected by the case.*

Holder Closed.

**It is always in proper position while in use and cannot be wrapped around the staff or case by the wind.**

For further information, prices, or samples, address

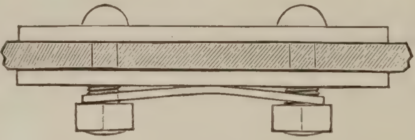
*TALLMAN & CO.,* **Grand Rapids, Mich.**

# *EXCELSIOR SINGLE AND DOUBLE*

# Automatic Nut Locks

OR

# FISH PLATE SPRINGS.



Double.

It is well understood in mechanical practice that where a combination of iron plates are "screwed together with bolts and nuts, and subjected to jar, that said nuts, bolts and plates will become loose."—And in no place does it appear to give more trouble than on railroad tracks, where the joints are so numerous and the jar is so heavy, by trains running over them, which causes friction, and the nuts, bolts and fish plates become loose and rattle. We find in our EXCELSIOR AUTOMATIC NUT LOCKS or FISH PLATE SPRINGS a positive remedy.

Place the springs as shown in cut, with the eyes bearing outward against the nuts, and screw them up the usual way, by which the springs are compressed against the fish plate, the two ends of the springs becoming levers pressing against the nuts ; the springs now become permanent automatic levers, pressing heavy between the nuts and the fish plate.

By this invention the loosening of the nuts, bolts and plates is prevented, and the joint is as solid as any part of the rail. They cannot rotate with the nuts, and are not easily lost or mislaid. They make a permanent, fast joint, and saves the labor of track-men screwing up nuts.

The single Nut Locks can be used on bolts for switches, as well as rail joints, and all places where distances are irregular between bolts.

They are patented in the United States, Canada, England, France, Germany and Belgium ; and we claim that they are cheaper, more durable and effective, and, being hardened and tempered, always retain their life and elasticity. And we challenge all competitors for their equal in effectiveness and durability.

*These Nut Locks have been adopted by the New England Roadmasters, in Conventions held at Hartford, Conn., October 19th and 20th,* 1887, *and Boston, Mass., August 15th and 16th,* 1888, *as the best Nut Locks shown.*

In placing the double spring on the bolts the centre of spring should bear on the fish plate, and screw them up the usual way.

Sample lots furnished for trial, *free of expense*, by forwarding the distance between centres of fish plate bolts.

Correspondence and orders solicited.

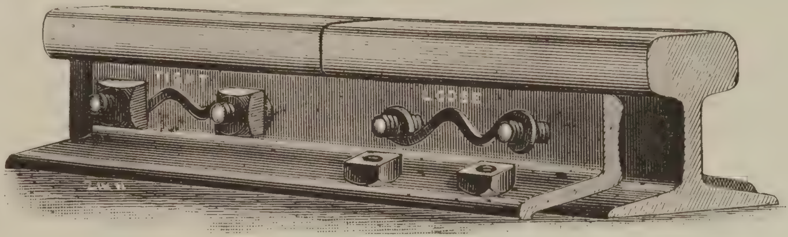
## RUFFNER & DUNN,

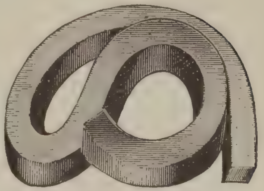
**Patentees and Sole Manufacturers,**

**SCHUYLKILL FALLS, - PHILADELPHIA, PA.**

### THE EXCELSIOR SINGLE AND DOUBLE

# Automatic Nut Locks and Fish Plate Springs.





Single Nut Lock.

The Excelsior Automatic Nut Locks and Fish Plate Springs, the cheapest, most durable and effective Nut Locks known, in use.

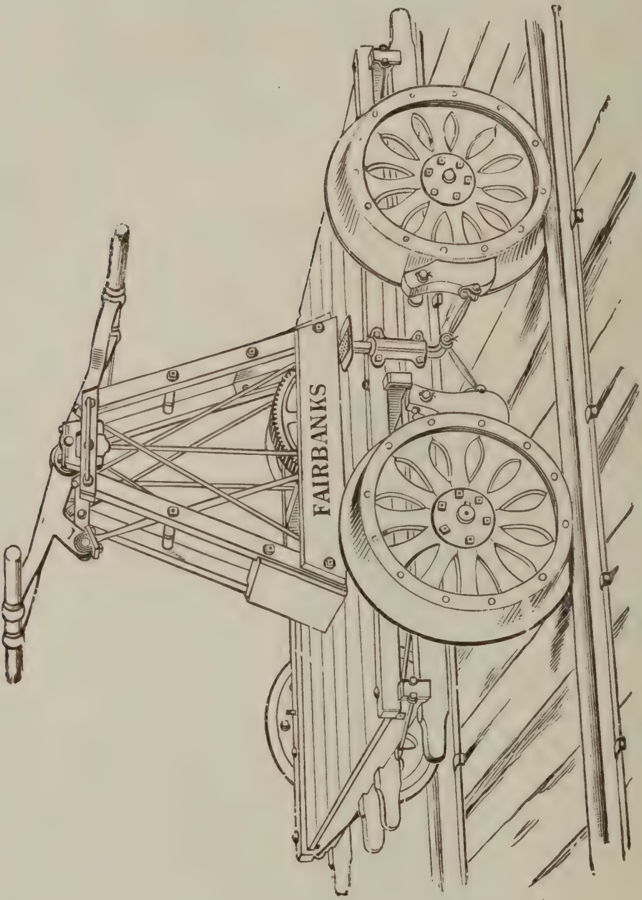
Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish plate bolts. Correspondence and orders solicited.

These Nut Locks have been adopted by the New England Roadmasters, in conventions held at Hartford, Conn., Oct. 19th and 20th, 1887, and Boston, Mass., Aug. 15 and 16th, 1888, as the best Nut Locks known.

***RUFFNER, DUNN & CO., Patentees and Sole Manufacturers,***

**Schuylkill Falls, Philadelphia, Penn.**

For Latest and Best Designs in Hand Cars, Push
Cars, Track-Laying Cars, Bridge-Gang Cars, Inspection Cars, R. R. Velocipedes, Track Jacks,
Car-Box and Bridge Jacks, Drills, Wrecking Frogs, Track Tools and Railway
∴ Goods of All Sorts, ∴



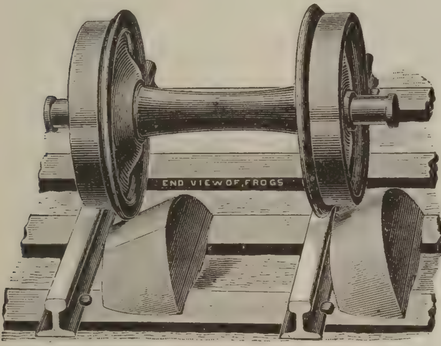
APPLY TO THE
LEADING RAILWAY SUPPLY HOUSE OF AMERICA,
*FAIRBANKS, MORSE & CO.,*
☞Catalogues Free. CHICAGO.

# B. E. TILDEN & CO.,

## CLEVELAND, O., U. S. A.

## *RAILWAY CAR AND LOCOMOTIVE*

# Re-placing Frogs and Bridge Guards.

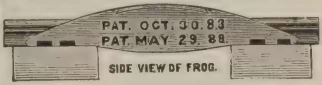


The Tilden Improved Wrecking Frogs for all Railroads, the only strictly reliable invention in use for replacing any derailed rolling stock.

Price, $18.00 per set for Standard size—Car Replacers. Special Steel or Extra heavy, for Consolidated Engines, $20.00 per set.

All goods delivered free by freight to any Ry. in United States not west of Missouri River points.

Weight of Standard sizs, about 160 pounds per pair.


PAT. OCT. 30. 83
PAT. MAY 29. 88.
SIDE VIEW OF FROG.

BRIDGE GUARDS, similar to outside Frogs, but longer, with attachments, $100.00 per set. Street Car Replacers and Hose Bridge, $8.00.

**THE RE-PLACERS FOR RERAILING ANY ROLLING STOCK.**—They will convince any practical operating railroad man of their superiority over all other replacing devices. They will pay for themselves in saving of time over the use of any other Replacers or Wrecking Frogs, as they will replace any cars or locomotive in about one-fourth the time consumed by other Replacers. They will retain themselves where dropped, and save time and expense in any case of derailment. They are in use on several hundred of the principal railroads and giving perfect satisfaction.

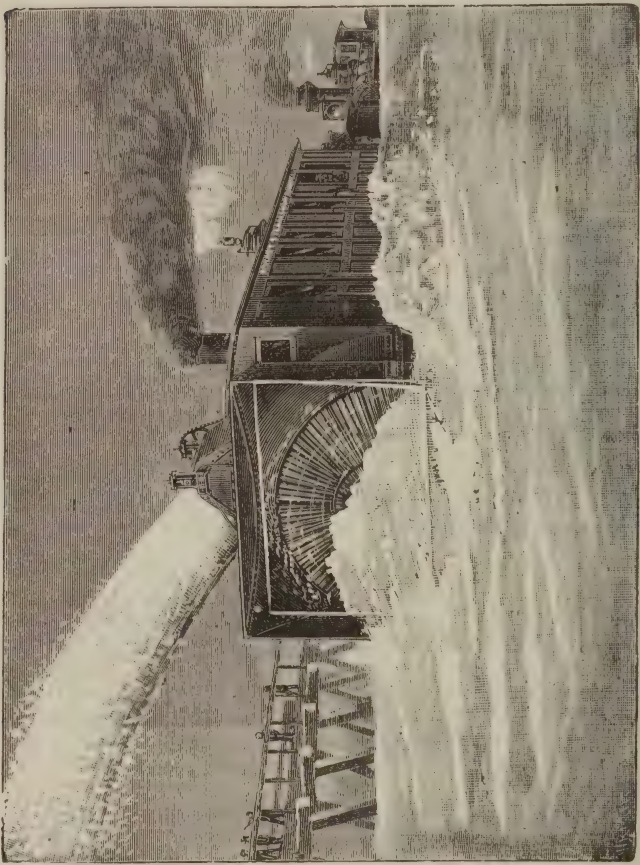
These Bridge Guards are the best possible protection to any bridge or trestle. They are similar to the Standard size Wrecking Frogs, illustrated above, but longer. They are placed outside of each rail, and opposite each other. They are positive in replacing any derailed rolling stock, and at the same time are placed at a sufficient distance from the rails to allow all rolling stock to pass upon the rails free of the guards. By using the WreckingFrog size you will be convinced that the Bridge Guards will replace any derailed rolling stock at any speed. Blue prints and complete description furnished on application.

☞ We Challenge the World to produce Wrecking Frogs equal to ours for good service, time, convenience, and durability, also to meet us in contest for quick and sure re-railing.

# America's Famous Snow Plow!

## THE ROTARY.

The Truth is Bound to Come Out Sooner or Later.



Railroad Officials will not allow themselves to be misled by erroneous statements.

Notwithstanding the misrepresentations which have been made and are being made, the facts this time are that the three great Pacific Companies, viz., THE UNION PACIFIC, NORTHERN PACIFIC and SOUTHERN PACIFIC, are amongst the leading railway companies who have placed their snow plow orders with us for this year's delivery. Snow sheds and the old push plows are gradually but surely becoming a thing of the past, as several of the leading Western roads have decided not to build any more push plows or snow sheds, but instead they are equipping their lines with ***"The Rotary."***

The Union Pacific leading the way with nine rotaries, Northern Pacific, Southern Pacific and Denver & Rio Grande following close after, and the other Western lines are adopting the ROTARY as their standard snow plow after having thoroughly tested all other known devices.

We can safely guarantee the Rotary to clear ten miles of track to any other steam snow plow's one, and do the work 50 per cent. better with but one-half the motive power.

*The Leslie Bros. Mfg. Co., - Paterson, N. J.*

# THE WEIR FROG CO.

HAVE THE LARGEST CAPACITY FOR

# TRACK ❖ SUPPLIES

*West of the Alleghany Mountains.*

---

☞ Note carefully the following pages. ☜

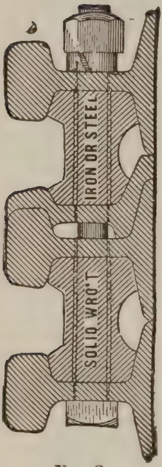
# THE WEIR FROG CO.

Manufacturers of the most Complete Line of

## .·. TRACK SUPPLIES, .·.

And have the largest capacity of any similar concern West of the Alleghany Mountains.

*WORKS: Front, Smith and Water Sts.,*
*CINCINNATI, OHIO.*



*No. 2.*

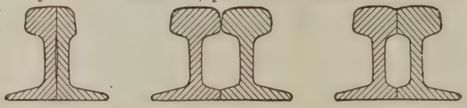
In the list of their manufactures may be mentioned Six Styles of Rigid Frogs, Eight Styles of Spring Frogs, the well-known Clarke-Jeffery Split Switch with F. C. Weir's Improvements, Crossings, etc., illustrations of a few of which are shown herewith.

First, we desire to call the attention of the Roadmasters to our Rigid Frog, which is shown in cut, and Cross Sections, Cuts 1 and 2, Cross Sections of which shows our Specially Rolled Solid Steel or Wrought Iron Filling process. These Frogs are secured with ⅞ Through Bolts, the widest National Lock Washer Co.'s Nut Locks, and Hex Nuts, making a very strong and durable job.

There having been some discussion as to the merits of the different methods of constructing points of frogs, we have concluded to show them all up, believing there will be but one conclusion by the level-headed, practical trackmen.

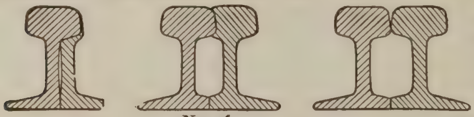
*No. 1.*

Cut Cross Section No. 3 shows original method of maki'g points of frogs by notching the main point rail to receive short point rail.



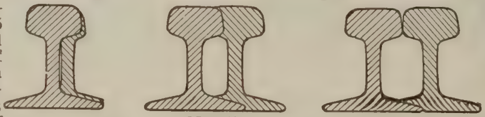
*No 3.*

Cut No. 4 shows the first improvement on this, by which the head of the main point rail was preserved but the base weakened.



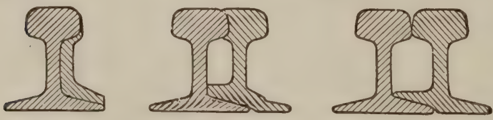
*No. 4.*

Cut No. 5 shows the full strength of the main point rail preserved, but at the cost of very materially weakening the short point rail, so that it has a very slim vertical support.



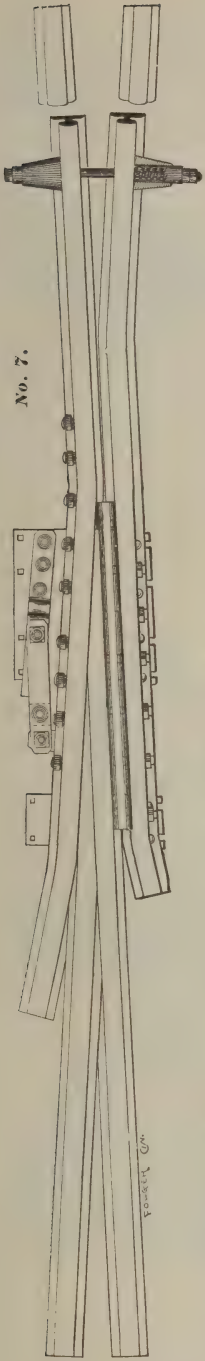
*No. 5.*

Cut No. 6 shows the latest improvement, which is the WEIR system, manufactured and controlled exclusively by us. This is what we term our Die-formed Short Point. By this method we not only save the full strength of the main point rail, but more of the original strength of the short point rail, and produce a stronger construction of the point rails generally.



*No. 6.*

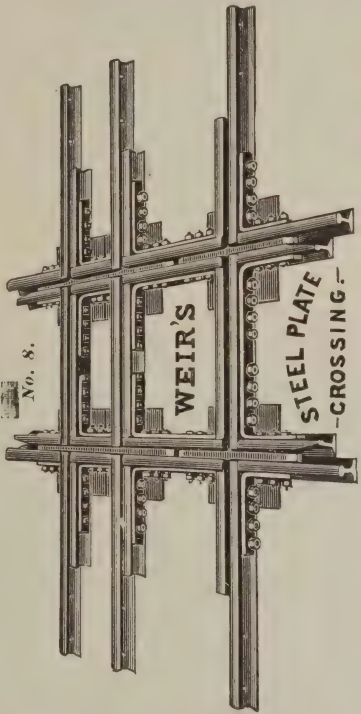
These cross section cuts are fair illustrations photographed down from full-sized drawings, therefore they can be unhesitatingly accepted as correct.



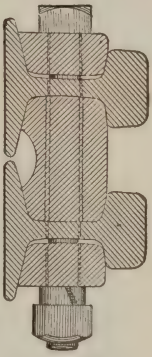
No. 7.

Cut No. 7 shows plan of one of our designs of Spring Frogs on Steel Plates. In this style of Frog we use a bent arm, one end riveted to the Steel Plate, and the other end acting as a holding down device in connection with the double links which connect this Arm to the movable Wing Rail. We know of no other device which resists the tendency of the Spring Wing Rail to creep, and at the same time produces so little friction in the parts as this device does.

The heavy protection Bar, it will be observed, is secured to the web of the Rail with ¾ Bolts either way from the extreme point of the Frog, and this insures the holding together of the Rail in the event of its being broken, and thereby avoiding an accident. For the above reasons we believe this to be the most efficient and durable Spring Frog in the market.



No. 8.



*No. 9.*

Besides this we are making five other designs, some lower priced and some more expensive, but we feel confident we can suit any one, no matter what his ideas are. Blue Prints of these different designs will be furnished on application.

Our crossings made with specially rolled Solid Wrought Iron or Steel Filling as shown by Cut No. 8, and Cross Section No. 9 are very extensively used.

These Crossings are secured with specially rolled very heavy Wrought Iron Bars, which with the use of eight or more through Bolts ⅞ of an inch in diameter, Hex Nuts, the Widest National Lock Washer Company's Nut Lock, produce the strongest and most durable structure possible ; and being supported on Steel Plates at each corner the durability of not only the Crossing, but also the Ties is assured without impairing the elasticity.

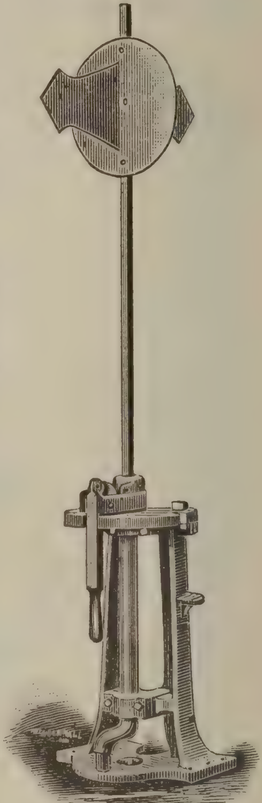
We show our patent Three-Throw Split Switch with patented Low Target Ground Throw Stand by cut No. 10. This Switch presents many new and valuable features, and in Yards when Three-Throw Switches are sometimes a necessity, we can especially recommend it as being safer, more durable, and easier on the rolling stock than any Switch now in use. The Stand, which throws the switch by means of a single lever, is the only Low Target Ground Throw Stand for Three-Throw Split Swithces in the market, and as a Ground Throw Stand is desirable in Yards, we feel that we have a Stand especially adapted to the purpose. The fastenings which connect the Rails and Bars are the same as those used in our Single Split Switches *i. e.*, Steel and Die Formed. They come nearer an absolutely unbreakable fastening than any now in use. The opening through which the Bar passes is large enough to permit considerable lateral movement of the Bar, which allows the Switch Rails to move more freely.

Our Steel combined Brace and Friction Plates used with these have no equal, as they are indestructible, and we alone have the right to furnish them. All of the Friction Plates of this Switch are Steel, and all of them pass through under both Main Track and Split Point Rails, so that an equal bearing is always insured on both the Main Track Rail and Friction Plates.

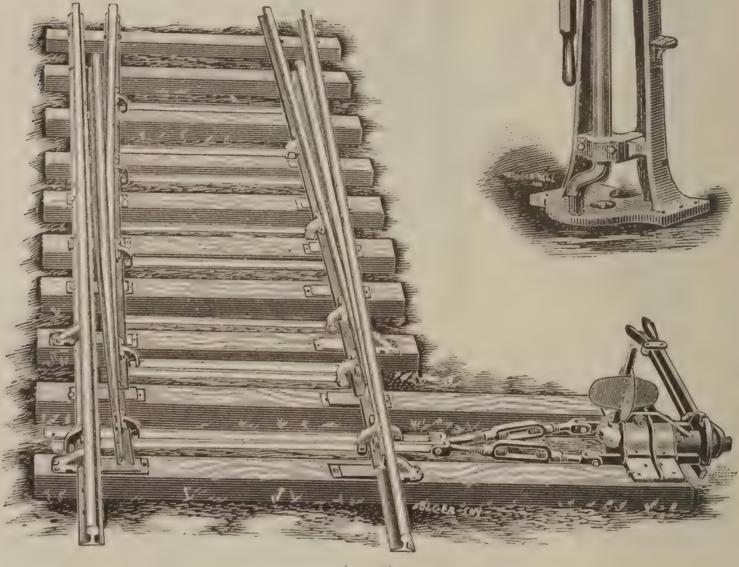
Our capacity for furnishing these Switches is practically unlimited.

Our High Switch Stand, shown on cut No. 11, is what we term our Union Pacific Pattern ; possesses the merit of not permitting tampering with the Connecting Rod when it is once put on in its place and the Crank Shaft bolted up, as the Bottom Plate under the Stand prevents removal. The Locking Device in the Lever Casting at the top of the Stand is very simple and very effective, as will be seen by the cut. We make this pattern that we term High Stand, and also a pony Stand, which is not more than half its height, with any style of Target as desired.

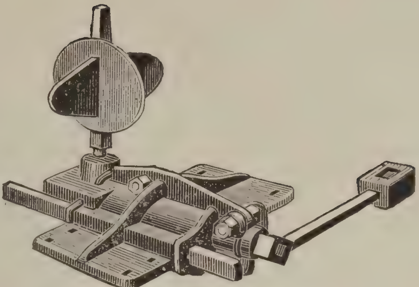
***No. 11.***



***No. 10.***

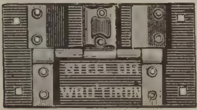


We also have another Switch Stand that we term our Automatic Low Target. This is shown by Cut No. 12. It is very positive in its motion and a very durable Stand. It can be used with either Stub or Split Switch, but is Automatic only with Split Switches when trailing through them. We have furnished large numbers of these with excellent satisfaction.



*No. 12.*

Cut No. 13 illustrates our Open Hearth Steel Plate Head Chair. These are so well known that it is hardly necessary to make any remarks as to their merits, but it may not be generally understood that because of using Steel Plates we are enabled to preserve the elasticity of the Switch Joint and thereby prolong the life of the Switch Rails as well as furnish a Head Chair that will outlast any other in the market. We are furnishing these in car-loads, which alone is sufficient as to their merits.



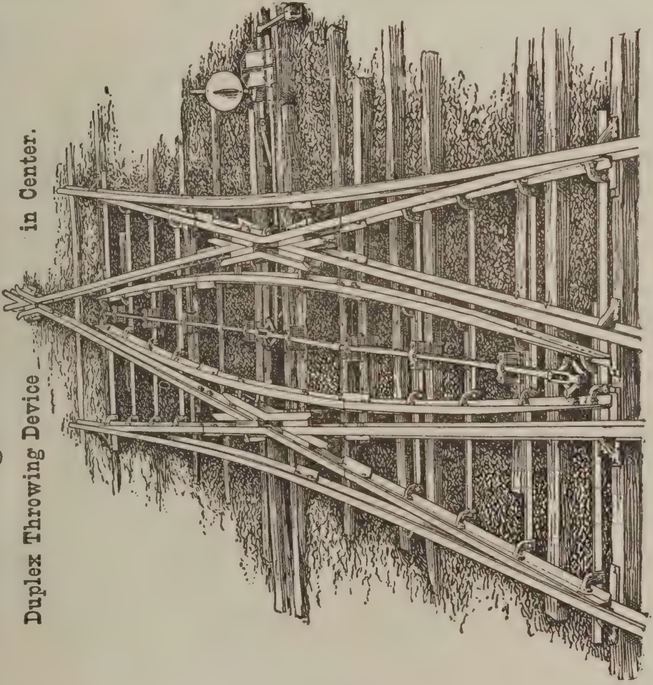
*No. 13.*

We call especial attention to our new design of Combination Crossing or Slip Switch with Duplex Throwing Device (See Cut 14). Two Rods are used for throwing the Switch Points,—hence the name Duplex—which are operated by one double-acting Stand. These Rods move simultaneously in opposite directions, and work double toggle joints which throw the Switch points. Turn Buckles are provided so that the Rods can be easily adjusted to give the required throw of the Switch points.

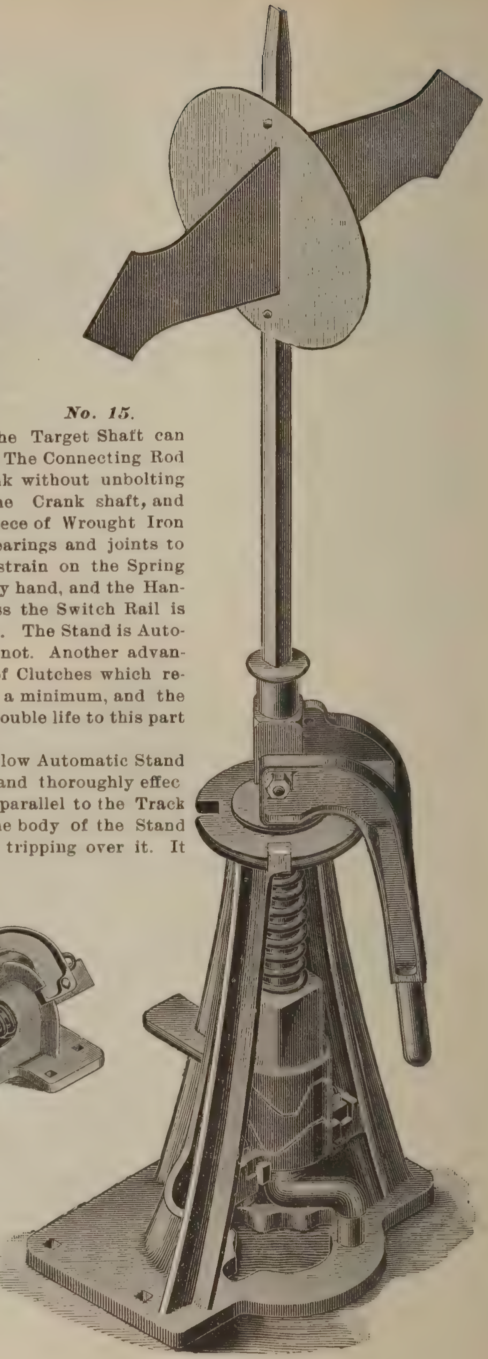
We are the first to place a Longitudinal moving Rod or Shaft in the center of the Device between the Tracks, and thus relieve the Yards and Tracks of such obstructions. The movement of this Device is positive, accurate and easy, and is shown worked with one Stand. These Combination Crossings can be made either angle 7 deg., 10 min.; 8 deg., 12 min., or 9 deg., 32 min., but the No. 7 Combinations, angle 8 deg., 12 min. is considered the best, inasmuch as it fulfills the requirements of a Crossing and a turnout with equally satisfactory results.

The Weir Frog Co.'s Combination Crossing.

Duplex Throwing Device in Center.



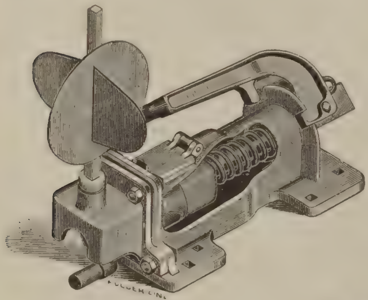
*No. 14.*



*No. 15.*

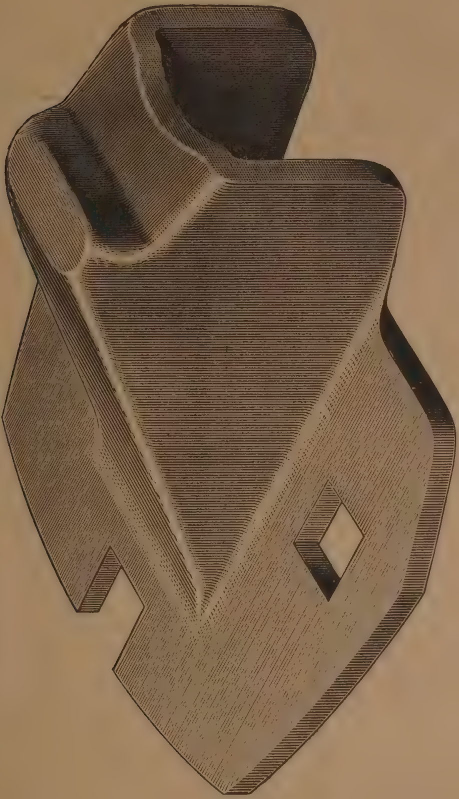
Fig. 15 shows our High Automatic Switch Stand which possesses some entirely new features, the most conspicuous being the Three-part Clutch having faces of different inclinations. By the use of this we are able to furnish a Stand which offers less resistance when the Switch Rail is being forced open, and at the same time closes the point Rail tighter than with any other form of Automatic Clutch Stand. Besides the advantage of using a Three-part Clutch there are one or two others worth mentioning. The Stand can be used on either one or two ties and the Target Shaft can be turned to suit the Track. The Connecting Rod cannot be taken off the Crank without unbolting the bottom bearing and lift the Crank shaft, and the Crank and Shaft are one piece of Wrought Iron with long carefully fitted bearings and joints to reduce wear. There is no strain on the Spring when the Switch is thrown by hand, and the Handle cannot be dropped unless the Switch Rail is tight against the Stock Rail. The Stand is Automatic whether padlocked or not. Another advantage is the large diameter of Clutches which reduces possible lost motion to a minimum, and the Three-part Clutch insures a double life to this part of the mechanism and Stand.

Fig. 16 shows design of our low Automatic Stand for Yard use, and is compact and thoroughly effective. It stands on two ties parallel to the Track and the handle lies close to the body of the Stand where there is no danger of tripping over it. It has all the advantages of the Automatic High Stand as regards its operation and the general details of its parts.



*No. 16.*

# STEEL DIE FORMED RAIL BRACE



*No. 17.*

We show by Fig. 17 one of the six designs of Steel Die Formed Rail Braces which we make. They are made of Homogeneous Steel Plate ¼ to 5-16 inches thick as preferred, and are Die Formed to fit any section of Rail, and our Machinery built especially to manufacture these Braces, gives us a capacity of Ten Thousand a day.

## In making orders for Frogs, Switches, Crossings or Head Chairs,

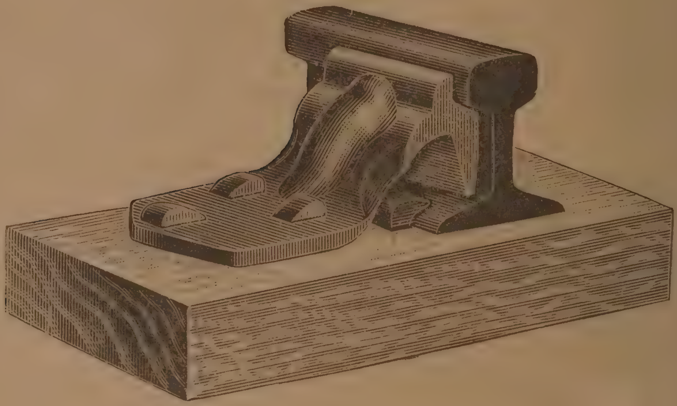
the section of Rail should be furnished, giving height, weight, distance of Fish Plate holes, gauge of Track, and angles of Frogs and Crossings. Blue Prints are requested for any or all of this work whenever they can be furnished. Promptness is guaranteed in filling orders as well as good workmanship. Estimates, also Lithographs and Photographs furnished on application. Address

**THE WEIR FROG CO.,**
**Front, Smith and Water Sts., CINCINNATI, O.**

Ajax Forge Company,

CHICAGO, ILL.

STEEL RAIL BRACES



To fit any section of rail.

*Frogs, Switches and Crossings*

OF EVERY DESCRIPTION

*AND OF THE MOST APPROVED PATTERNS.*

**Switch Stands and Fixtures,**

STEEL FOOT GUARDS.

IRON or STEEL HEAD CHAIRS.

**NEW YORK OFFICE: 115 BROADWAY.**

PROPERTY
Civil Engineering Department
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# The New England
# Roadmasters' Association

## Proceedings,–1891.

RAMAPO IRON WORKS

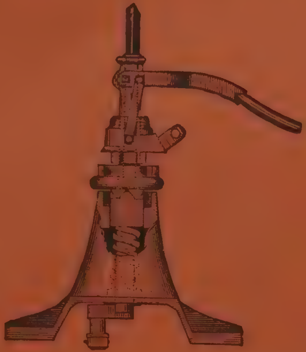
—MANUFACTURERS OF—

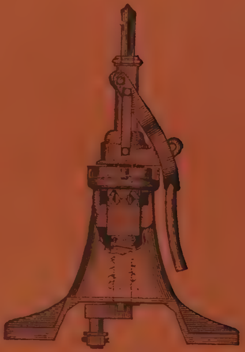
SAFETY SWITCHES,

—AUTOMATIC—

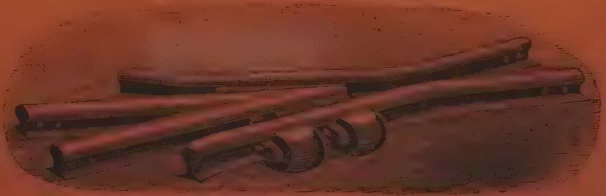
*Safety Switch Stands.*

**Office and Works, HILLBURN, Rockland, Co., N. Y.**





FROGS AND CROSSINGS



# PROCEEDINGS

OF THE

# Ninth Annual Convention

OF THE

# NEW ENGLAND

# Roadmasters' Association,

HELD AT THE

AMERICAN HOUSE, BOSTON, MASS.,

August 19th and 20th, 1891.

---

EDITED BY THE SECRETARY.

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NORTHAMPTON, MASS.:
PRESS OF GAZETTE PRINTING CO.
1892.

# OFFICERS.

*President,*

| | | |
|---|---|---|
| F. C. Clark, | H. R. R., | Falls Village, Conn. |

*Vice President,*

| | | |
|---|---|---|
| C. B. Lentell, | B. & A. R. R., | Boston, Mass. |

*Secretary and Treasurer,*

| | | |
|---|---|---|
| G. L. R. French, | B. & M. R. R., | Northampton, Mass. |

*Chaplain,*

| | | |
|---|---|---|
| E. W. Horner, | C. V. R. R., | Rutland, Vt. |

*Executive Committee,*

| | | |
|---|---|---|
| W. E. Clark, | V. V. R. R., | Charlestown, Vt. |
| A. C. Stickney, | B. & M. R. R., | Boston, Mass. |
| F. Holbrook, | N.Y.,N.H. & H.R.R., | Stamford, Ct. |
| E. K. Post, | N.Y.,N.H, & H.R.R., | Hartford, Ct. |

The President. The Vice President.

The Secretary.

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# PROCEEDINGS.

The Ninth Annual Convention of the New England Roadmasters' Association was held at the American House, Boston, Mass., on August 19th and 20th, 1891.

Pursuant to the call for the Convention, on the afternoon of August 19th, at 2 o'clock, the President, Mr. W. E. Clark, called the members to order, and requested the Chaplain, Mr. E. W. Horner, to open the proceedings with prayer.

PRAYER BY THE CHAPLAIN.—Our Heavenly Father, we thank Thee for another year of life, a year of opportunity, a year of activity, a year of usefulness, as we hope and trust. We thank Thee for the mercy that has spared our lives. We thank Thee for the blessing of sound minds and judgment, and all that has helped us in the work that we had to do. We thank Thee that we have not been weakened, we have not been reduced, we have not been turned aside from our avocations, from our responsibilities, from our cares. We remember that one of our number has fallen, and we would be reminded by this of our mortality, of our frailty, that we, too, are subject to sickness and death. We know that it is appointed unto all to die, and after death the judgment; and we would so contemplate Thee, and so consider upon our ways, that it may be well with us when the last hour shall come. We ask that Thou wilt forgive all that Thou hast seen amiss in us, and that Thou wilt direct us by that wisdom which is from above, in all affairs of life, and especially in the affairs of this Association, in the affairs of our avocations, in the responsibilities put upon us as overseers of the ways of this section of our land. We realize that heavy responsibilities devolve upon us. We realize that many lives, much welfare, much value, is entrusted in a certain measure to our care. We would be faithful, increasingly faithful, increasingly watchful, ever on the alert for improvement, that the ways over which we watch may be made safer and stronger and better. We would not trust wholly to miraculous power, we would exercise our best judgment, and our best fidelity, and our best care, in all this work. We pray that Thou wilt help us, every one. We pray that we may come more and more to trust in Thee, and to look to Thee for help, and for guidance, and for strength, and for judgment, and for that wisdom which is profitable to direct in all things pertaining both to the life that now is and the life that is to come. Bless us to-day, give us wisdom and sound sense, that the best judgment and the best experience and the best wisdom of this Association may be brought to bear upon the questions that are introduced, and that we may go out a little stronger, a little better qualified for the year's work before us. Hear us, we beseech Thee, and bless those who are our superiors in office and in care and responsibility. We pray that increasing wisdom, increasing fidelity, increasing enterprise, may characterize the railway management of this country, and that we may see improvement, increasing improvement. We pray that Thou wilt avert and help us to avert, so far as we may, calamity, accident, and those fearful catastrophes that occur from time to time. We thank Thee that there have been so few, and we pray that they may be reduced to the smallest possible number. Help us now every one in the duties pertaining to this convention. Bless him who presides, and each one in their work, each one in their duty, each one in their place, and may it be with profit that we come here, and that we abide here for a little season. We ask it in the name of Christ, our Redeemer. Amen.

President—It has been customary for the President to make some remarks at the opening of these meetings, but

I shall depart from the usual custom, and make mine at the close of my career as President.

The Secretary, Mr. G. L. R. French, of the Boston & Maine R. R., read the minutes of the Eighth Annual Convention, and also those of the several meetings of the Executive Committee, held in the meantime.

President—Are there any remarks to be made upon the minutes as read by the Secretary? If not, we will declare them approved. Now we will hear the report of the Secretary and Treasurer.

Mr. French—I respectfully submit the following:

### SECRETARY'S VOUCHER, AUG. 1890 TO AUG. 1891.

| | | |
|---|---|---|
| Cash received from assessments, | $70 00 | |
| " " " entrance fees, | 24 00 | |
| " " " exhibitors, | 34 00 | |
| " " " members for testimonial, | 7 00 | |
| " " " sale of pamphlets, | 41 50 | |
| " " " advertisements, | 495 00 | |
| " " " treasurer, | 65 08 | |
| | | $736 58 |
| Cash paid for services and expenses of reporter, | $86 75 | |
| " " " duplicate copy reporters' notes, | 10 00 | |
| " " " printing pamphlets, | 504 50 | |
| " " " postage, | 17 28 | |
| " " " stamped wrappers for pamphlets, | 49 45 | |
| " " " printing notices, | 6 50 | |
| " " " clerical assistance, | 15 00 | |
| " " " stationery, | 6 25 | |
| " " " express and freight, | 2 80 | |
| " " " telegrams, | 1 80 | |
| " " " secretary's salary, | 25 00 | |
| " " out in connection with annual meeting and excursion, | 11 25 | |
| | | $736 58 |

G. L. R. French, Secretary.

## TREASURER'S REPORT.

| | |
|---|---|
| Cash on hand Aug. 1890, | $249 55 |
| " paid to secretary as per voucher, | 65 08 |
| " on hand Aug. 1891, | $184 47 |

The enlarged size and general improvement in the style of our annual publication, together with the extra expense of postage and wrappers for mailing it throughout the United States, increased our expenses over and above previous years, but this general change was strongly called for by our advertisers, and will be attended by profit to all.

G. L. R. French, Treasurer.

President—You have heard our Secretary and Treasurer's report. If there are no objections we will accept it, and it is so accepted. The next business in order is roll-call.

The roll was then called ; the † before names in the list of members at end of book indicates those present.

The names of persons proposed for membership were then presented and favorably acted upon ; the * before names in list of members indicates the new members.

Mr. French—Mr. Patch, who is not here, sends this communication :

To the members of the N. E. R. M. A.—Gentlemen :—I regret very much that I cannot meet with you in this your Ninth Annual meeting, but I assure you most earnestly that my heart and pocket book are both with you.

Respectfully,
J. R. Patch.

President—If there are no objections we will omit the reading of the constitution and by-laws. The next thing will be the reading of communications by the Secretary. The Secretary says he has read the only communication he has, the one from Mr. Patch. and we will now proceed to the election of officers. Please prepare your ballots for President. I will appoint Mr. Bishop and Mr. Shanks as tellers. I will say for the benefit of the new members, that we consider them members from this out. They have a perfect right to vote, and we put off signing the by-laws so as to avoid confusion, that is all. We should be glad to have them all vote.

A ballot was then taken for President, resulting in 23 votes being cast for F. C. Clark, 2 for A. C. Stevens, and 1 for C. B. Lentell. The President declared Mr. F. C. Clark elected.

President—The next in order will be the election of Vice-President. You will please nominate your candidates.

C. B. Lentell and E. K. Post were nominated, and on a ballot being taken, Mr. Lentell was found to have received 21 votes, Mr. Post 5, blank 1. The President declared Mr. Lentell duly elected Vice-President for the ensuing year.

President—The next in order will be the election of Secretary and Treasurer; please make your nominations.

G. L. R. French was nominated. On motion of Mr. Hyland, seconded by Mr. Collins, Mr. Bishop was authorized to cast the vote for the convention, and a ballot being taken, Mr. French was declared unanimously re-elected Secretary and Treasurer for the ensuing year.

President—The next office to fill will be Chaplain; please make your nominations.

E. W. Horner was nominated. On motion of F. C. Clark, seconded by Mr. Shanks, Mr. Bishop was authorized to cast the vote for the convention, and a ballot being taken. Mr. Horner was declared unanimously re-elected Chaplain for the ensuing year.

President—Gentlemen, if there are no objections, I will appoint the tellers a committee of two to nominate members of the Executive Committee for the ensuing year.

The tellers, Mr. Bishop and Mr. Shanks, retired for consultation, and subsequently presented the names of W. E. Clark, A. C. Stickney, E. K. Post and F. Holbrook.

On motion of F. C. Clark, duly seconded, Mr. Drew was instructed to cast one ballot for the convention, for the persons nominated by the committee, and a ballot being taken, W. E. Clark, A. C. Stickney, E. K. Post and F. Holbrook were declared duly elected the Executive Committee, in connection with the President, Vice-President and Secretary, for the ensuing year.

## REPORTS OF COMMITTEES.

President—The next thing in order will be reports of committees. The first is the Committee on "Track Joints, trouble experienced with joints now in use, and points new ones should cover." Mr. Holbrook, chairman of the committee.

Track Joints: We have all had trouble enough with joints to know some of the defects of those now in use. The only joint in common use on new work at present date, in this country, is the angle-bar. All of the forms of joint fastenings which preceded it are fast going to the scrap heap, and their defects are too well known to need mention.

The angle-bar is comparatively cheap, and this, with its many other good qualities, has led to its almost universal use on "T" rails. For a light traffic it does well, and we doubt if much greater expense is warranted for a joint under light traffic. ' We must all admit, notwithstanding the almost universal use of the angle-bar by railroads in this country, that it is far from making a perfect joint, though with proper care, if well proportioned to start with, it comes nearer filling the bill than anything else that your committee has seen used.

The following points we feel sure will appeal to trackmen:

1. Without good ballast one cannot have good joints the year around, no matter what style of joint is used.
2. No matter what fastenings are used, good joints cannot be kept without a considerable amount of labor.
3. One of the most provoking defects in any joint fastening is the fact that often it is made from poor material, in which case we have known the bar to crack when track was in good line and surface.
4. Oftentimes angle-bars are bent laterally in cutting, and if the outside bar is the heavier, as is usual on most roads, it will knuckle the joint in or out; the inside plate and the rails taking the form of the bent outside bar, and no amount of spiking in at the joint will keep rails in line. In such cases the bars should be taken off and straightened, or nearly so, with a hammer.

5. The imperfect fit of any joint fastenings is a source of annoyance and poor riding track, for no bolts will remain tight long if all the strain comes on them, as must be the case when the angle-bar does not fit closely under the rail head. We have all seen rails dapped off at the end and hammered by every wheel that goes over them or the joint cocked up in the air on account of this imperfect fit.

6. We believe a suspended joint is better than a supported one in any case, although one of your committee dissents from this. A train going over a joint strikes the end of the head rail harder than the back one, consequently the wheel bounds from the end of the rail and strikes the rail a blow some twelve inches ahead of the joint.

A suspended joint has a tie under this point and on double track roads, you can tamp this tie harder than the back tie, thus avoiding the surface bending of the rail at this point. On single track roads, on heavy grades, you often see the rails bent in this same way. The head rail in the direction of fastest running being the one that is bent.

7. All joints should provide proper means of securing rails to ties to prevent running and preserve proper expansion. A suspended joint gives two *ties* to do this instead of one.

8. No joint fastening can ever prevent low joints entirely, however perfect it may be, but we think an improvement on the angle-bar can be made for most uses.

9. The angle-bar fills the bill for lateral pressure, keeping joints in good line, but expecting a joint to stay up by clamping it between two angle-bars, especially when the clamping is done by bolts, is poor mechanics, and not good common sense.

A joint needs support underneath more than sideways, and why not give it the support it needs by putting a plate under it, or some other proper support? If a plate is used, it should be so made that it will be part of the joint so that it will not allow the rail to play up and down, forming an anvil of the plate, thus causing the rail to batter and the joint to rattle, and constant wear of the parts in contact.

10. Joints should have as few parts as possible. There is nothing worse than a multiplicity of pieces to be kept around all the time.

11. In conclusion we would say, use as long rails as can be well handled; 30 ft. ones are better than 28 ft., for you will have fewer joints. Whatever joint you have, keep it

bolted up tight and your joints will show the little extra attention at once.

All of which is respectfully submitted,

F. HOLBROOK,
J. R. PATCH, per H. } *Committee.*
C. S. LANE,

On motion of Mr. F. C. Clark, seconded by Mr. Horner, the report was accepted and laid on the table to be taken up for discussion later on during the present session.

President—The next committee to report will be that on "Fences, cattle guards and railroad crossings. F. E. Sibley, chairman.

Mr. President and Gentlemen :—The subjects, "Fences, cattle guards and R. R. crossings," are of interest to each one of us. Also the most economical way of maintaining them, and we as a committee would respectfully recommend as follows :

1st. Fences. We recommend at stations and thickly settled portions of a town or city, a board fence six feet high with moulded cap on top and barbs on top of the cap ; boards to be one-half inch apart and six inches wide. At places not very thickly settled, a braided wire fence with posts set about ten feet apart and four or more strands of wire, fastened to posts the wires to be not more than twelve inches apart, and top wire to be not less than four feet from the ground.

2d. Cattle Guards. We consider a surface guard as preferable and safer than the pit guard, and would recommend a guard consisting of straight parallel iron strips, about one-half inch thick, securely fastened to a frame and the frame fastened to the ties or other cross timbers, filling the space between the rails, excepting flangeway, and also the space from outside of rail to cattle guard fences, the ends of the iron strips to be beveled off, so that anything dragging from a train would not catch on them.

3d. Railroad Grade Crossings. We think the best way to dispose of them is to change them to either over or under grade. The next best, to fill the space between the rails with three inch southern pine plank, of course leaving flangeway for the wheeis, and also put two plank outside of each rail, and where there is more than one track, fill in between with broken stone or good coarse gravel.

Respectfully submitted,

F. E. SIBLEY,
E. E. STONE, } *Committee.*
E. K. POST,

On motion of Mr. Bishop, seconded by Mr. F. C. Clark, the report was accepted, and laid on the table to be taken up at some future hour of the meeting and discussed.

President — The third committee is that on "Best method of securing rails to ties outside of joints; holding gauge on curves, spikes, braces, plates, etc." Mr. Hyland, chairman of the committee.

Report of Committee on best method of securing rails to ties outside of joints:—We know of no better method than with good spikes, and for that purpose would recommend the Goldie Soft Steel Spike as being superior to any we know of.

For holding gauge on curves would recommend that the track be spiked wider than Standard Gauge one-sixteenth of an inch for each degree of curvature, not to exceed one inch. We do not believe in braces except on very sharp curves where it is impossible to hold the track without them. Your committee cannot speak from experience on tie plates, but think they would be advantageous in prolonging the life of soft wood ties and holding track to gauge on curves.

All of which is respectfully submitted,

R. HYLAND,
A. C. STEVENS,
R. P. COLLINS.

On motion of Mr. F. C. Clark, seconded by Mr. Bishop, the report was accepted and laid on the table to be taken up and discussed later on during the present session.

President—The fourth committee is on the question, "To what extent can wear of engine driving wheel tires be allowed before general economy demands them repaired." Mr. Bishop, chairman.

New England Roadmasters' Association—Gentlemen:—The committee appointed to report on the question to what extent can wear of engine driving wheel tires be allowed before general economy demands them repaired, find they have a very important subject to consider and will not be able to present the report to the Association and proper officers of railroads as forcibly as safety and economy demands. We shall expect all the members present to assist us when the subject is open for discussion. However, we will submit the following report:

The rule to be $\frac{1}{4}$ (one-fourth) of an inch the extreme, not to exceed $\frac{3}{8}$ (three-eighths) of an inch from the proper surface and bevel of wheels as adopted by superintendents of motive power as standard wheels.

We do not even consider them safe to be run on the road after passing the extreme mentioned, for while trailing through spring rail frogs and split switches the extra flange, as you might call it on outer surface of the wheels is liable to press the loose wing rail of a frog and the bent rail at the point of split switches out of line so a wheel would drop down on to ties and cause a wreck, and as a matter of economy a few badly worn wheels passing daily over the road will cause the renewal of many frogs and switches in three or four years, that otherwise would last twice that length of time or even more in many cases. We are reminded that it is an expensive operation to take an engine in for the express purpose of turning off the driving wheels.

We are informed from good authority that an engine is seldom taken in for this purpose alone, that they ought to run on an average about one hundred and fifty (150) miles daily for eighteen months, at end of which time they ought not to be track worn more than one-quarter or three-eighths of an inch, also at which time the driving boxes and other parts of the engine require repairing quite as much as the wheels, therefore only a very small part of the whole expense can be charged to turning off the tires.

In conclusion will say we do not see any economy to run an engine after passing the extreme three-eighths of an inch, and if this rule could be adopted and followed out it would very much reduce the breakage of frogs, switches, and rolling stock and also add safety to the running of trains.

Respectfully submitted,

George W. Bishop,
E. H. Bryant,
J. W. McManama.

On motion of Mr. Hyland, duly seconded, the report was accepted, and laid upon the table to be taken up in its regular order for discussion.

President—We will now adjourn to the ante-room and look over the mechanical exhibits, track appliances, etc., to return here at the sound of the gavel in fifteen or twenty minutes.

An intermission was here taken, during which the members of the Association repaired in a body to the room adjoining the meeting room ; carefully examined the inventions there on exhibition, and listened attentively to the claims urged by the various exhibitors in favor of their respective appliances, after which the proceedings were resumed as follows :

### TRACK JOINTS.

President—If you will give me your attention for one moment, I will have the report of the Committee on Track Joints read to you by our Secretary, and we will discuss that.

President—Gentlemen, the question is now open for discussion, and we should be pleased to hear from each and every one of you, giving your experience and the remedies for all evils that you know of in the present joint.

Mr. F. C. Clark—Mr. Stevens.

President—Mr. Stevens is called upon. I should also be pleased to hear from him.

Mr. Stevens—I don't know why Mr. Clark should single me out to start this discussion, but I will say a few words. I think the committee have made a very excellent report, and have covered the whole ground. I don't think it is open to criticism at all. The worst trouble to contend with in the matter of joints I find to be the lack of help to keep them properly surfaced up. As far as the suspended joint is concerned, I believe in it every time, although I am forced by circumstances at the present time to use a supported one. But I believe in a suspended joint, with the ties properly spaced, and a good-sized spike. Further than that report, I don't know what I can say ; it fills the bill, it covers the whole ground.

President—Mr. Shanks has had some experience. I should like to hear from him. It has become personal, and I think I shall call on all of you.

Mr. Shanks—Mr. President, we have all had some experience with track joints, and it strikes me that the report covers the ground pretty thoroughly. The difficulty that presents itself to my mind most of anything is, the lack of help, in many instances, to keep the joints in proper shape. Another thing that occurs to me is the fact that many of our roads are not ballasted properly. Having a soft road-bed will, of course, cause low joints to come, while on a good gravel road-bed the joints could be kept up with very much less labor. The nearer perfection we can reach in our road-bed, the less trouble we will have with joints. Another thing is the keeping of the bolts tight. We all have trouble with loose bolts—I have, and I guess most of you have. There the difficulty comes in again of lack of help to keep the bolts as they should be. I don't know that I can say much more on the subject at present.

President—There is one thing I would call attention of the members to: I would like to get an expression of the opinion of each one as to the size of the joint bolts, whether they are large enough, whether our angle-bars have the quality and weight of material they should have, whether they are heavy enough.

Mr. Shanks—In answer to our President's question in regard to the angle-bar, I don't know much about it, because I haven't got any. We use the Samson splice plain, therefore I can't say much about the angle-bar.

President—Bolts?

Mr. Shanks—In regard to bolts I think that there is more imperfection to be found in the construction of the bolt and nut than in any other one thing that we have to contend with about a joint. In the first place, the bolts are made of inferior iron, in many instances. The thread is poorly cut, and the nut is too thin. Most of our nuts, I think, are about five-eighths of an inch thick, when they should be an inch or an inch and a quarter, that is, such as we use. I think there is more difficulty in that than in anything else.

Mr. F. C. Clark—I would like to ask brother Shanks if he would increase the size of the bolt if he increased the size of the nut.

Mr. Shanks—No, I would not. I don't think it is well to increase the size of the bolt, because you weaken your rail by so doing.

Mr. Stevens—I think as you increase the size of the bolt you weaken your rail. I think a three-quarter bolt is big enough.

President—Mr. Mosier, we would like to hear from you.

Mr. Mosier—Mr. President. I think that as there are two other roadmasters from the Boston & Albany present, I will resign in their favor.

President—We would like to hear the scientific view and the practical.

Mr. Mosier—Both scientific and practical views are to be had from those roadmasters of the Boston & Albany.

Mr. Horner—I would call upon Mr. Lentell, Mr. President.

President—Mr. Lentell is called for.

Mr. Lentell—Mr. President, I don't know as I have much to say in regard to that. My experience has been solely with the one-tie joint, a supported joint. I have had no experience at all with two-tie joints or suspended joints. I have always been perfectly satisfied, and with a good road-bed have no trouble in keeping joints up. Of course in wet places, in certain seasons of the year, we have difficulty in keeping up joints, the same as others have; but I believe in supported joints, with a short angle bar. I prefer to wait and hear some further discussion of the matter before I say much more.

President—Do you increase the size of your bolts with the increased weight of the bars?

Mr. Lentell—No, sir, we have not. I don't know that it would be necessary as long as the present bolts hold. The only reason we could have for increasing the size of the bolt would be the size of the rail. So long as the bolts hold I don't know that there is any necessity for increasing their size.

President—You don't discover any need for increasing the size?

Mr. Lentell—No, sir.

Mr. Shanks—I would like to inquire, while the question of angle-bars is up, from Mr. Lentell, whether he ever experienced the fact that the angle-bar strains the bolts and causes them to break when the ties become cut in the joints.

Mr. Lentell—I never experienced that trouble, Mr. President, I do not have in mind a single case.

President—Mr. Lentell is on a road where they don't have any cut ties; you have taken the wrong man.

Mr. Lentell—We have to take some out, Mr. President, once in a while.

President—Mr. Greer, of the New York, New Haven & Hartford R. R., Northampton Division.

Mr. Greer—I would rather hear from Mr. Stone, first, of the Boston & Albany. He has just been laying some heavy rail with angle-bars, and I would like to hear from him. I trust you will excuse me, Mr. President, in favor of Mr. Stone.

President—Mr. Stone.

Mr. Stone—I think Mr. Lentell has said all that I can say on the subject of angle-bars; he has voiced my sentiments for me.

President—We would like to hear from all of you. Of course the Boston & Albany have had experience with heavy steel, and don't discover weak points like some of the rest of us here.

Mr. F. C. Clark—We have with us, Mr. President, one who was for years the Secretary of our Association, who was expert, I believe, in the care of track, expert in designing and drafting joints, who without doubt can give us some very fine points, and ask some close questions of those who have spoken, and those who are to speak. I would like to hear from Mr. W. F. Ellis.

President—Mr. W. F. Ellis is called for.

Mr. Ellis—I will say a few words; in view of brother Clark's words, calling me an expert. You will consider from whence it came ; he has a natural flow of language, as you well know. In regard to this subject, I have brought here some blue prints ; and as I told you a year ago I should not on the floor ever get up on any subject that was before you for discussion, in which I had any individual interest, but would probably give you a paper on any subject that I could consistently, and I have a short paper in regard to this subject, in which I ask a number of questions, and endeavor to give you statistics of the various joints in use—of an angle-bar, no other joint—in the country, showing in those statistics the different lengths, positions of holes and form, and bringing home to you why this difference exists, to answer the purpose that they are designed to :

On account of increased traffic and weight of rolling stock, rail sections of seventy-five to ninety-five pounds per yard are used with such design and wearing qualities as to expect even more years of service than can be expected of less weight rail, and that these expectations should be fulfilled, it is required that the ends of these rails should be united together, supported horizontally, vertically and laterally by the track joint as to give the same life to the ends as to the other parts of the rail, a safe and smooth passage to the rolling stock, pleasant countenances to the patrons of the road and increased revenue. The angle-bar of steel or iron is most extensively used at the present time as the standard track joint. This angle-bar varies in length from twenty to forty-eight inches, having four or six holes, different form and thickness in its head, neck and foot extending different widths beyond base of rail with one or three slots in same.

Since April 1890, I have collected a large number of blue prints of the rail sections with their angle-bars in use in this country, and from same have made a table showing this difference in the length, position of holes and slots, which is attached to this paper.

From that table I find there are in use angle-bar joints supported by one tie with four holes in same, length twenty to twenty-four inch, holes spaced four and three-quarters inches to eight inches, slots at center of angle-bar on such roads as B. & A., N. Y. & N. E.. Con. & Montreal, Cen. Vt., Rich. & Danville ; supported by three ties with six holes in same, length thirty-four to forty-eight inch, holes spaced five to twelve inches centers, some sloted for each tie, others for end ties alone on such roads as N. Y. C., Mich. C., Sou. Pacific, Sa. Fla. & West, N. P., C. & O., C. C. C. & St. L., B & M., Ca. Pacific, L. S. & M. S., Gr. Northern, A. T. & S. F., C. St. P. & O., D. & R. G., Mou. P., C. N. O. & Texas.

Supported by three ties with four holes in same, length twenty-nine to thirty-six inches, holes spaced five to seven inch centers, slots at end ties on such roads as Ch. & Al., Con. & Mon., C. B. & Q., and Me. Central.

Suspended on two ties with six holes in same, spaced from four to six inch centres on such roads as Phil & Read., Penn., B. & O., N. Y. L. E. & W., L. V., C. R. R. of N. J.. Del. & Hud. Canal, C. R. R. of Ga.; thirty inch long except Penn. R. R., who use thirty-four inch.

Suspended on two ties with four holes in same, spaced five to eight inches in centers, length twenty-two and one-half to twenty-four inches on such roads as Grand Trunk, N. Y. P. & B., O. C., Fitchburg, Ch. M. & St. P., N. Y. N. H. & H., Ch. & N. W., L. & N., C. R. I. & Pacific, Conn. River, Ill. Cen. & Northern Pacific.

Ch. & N. W. on a great many miles have in use a base plate twenty-four inches long, same length as their two tie angle-bar in connection with angle-bars. The C. B. & Q. three tie angle-bars thirty-five inches long, ties spaced sixteen-inch centers, have the ends of angle-bars lapped by each other by two inches.

The Lehigh Valley have on two miles of their track, rails forty-five feet long, laid on their suspended two ties, six hole angle-bars, thirty inches long and rails cut on a mitre, center holes four inches centers.

Some of the roads have in use different track joints, but I have intended to give what now, or was in 1890, their standard angle-bar. A portion of these blue prints I have brought for your inspection at this meeting, those of the New England roads by themselves, also those that are somewhat peculiar. On two other sheets I show some of the heaviest rail sections with a cross section or form of angle bar in use. You have in New England to-day in use all the different angle-bars enumerated except six hole two tie, suspended thirty or thirty-four inches long and from a comparison of those in use these questions can be asked as regards the angle-bar as a track joint :

What should be its form or cross section ? Its length, suspended or supported, with one, two or three ties under and four or six holes through same ? Form of foot and position of slots in same ?

It has these duties to perform ; not to hinder the contraction and expansion of the rail which, in our New England clime, is sudden in its changes, yet at the same time the creeping of the track must be prevented ; it must allow the wave motion of the rail ahead of the loaded wheel to pass out at the end of the rail, or strong and elastic enough to continue that wave motion to the adjoining rail; it must stand the shock downwards of the loaded wheels as they come upon same, and not give laterally from wide gauge or badly worn wheels running upon the track, sometimes out of line, surface or correct gauge.

From my past experience and observation I will try and answer the questions I have asked. For its form or section, I would have the angle-bar ; have a head at least one inch thick ; corners of same not sharp ; its neck a thickness five-eighths of an inch for inside and three-fourths of an inch for outside bar and proportioned thickness at its foot, so as to be somewhat similar to that shown with the ninety-five pounds B. & A. rail section which is of the Fitz-Sayre pattern ; this foot extending out beyond edge of base of rail three-fourths of an inch, and bottom of foot to be level with top of base of rail with a thickness of five-sixteenths of an inch at its outer edge (the N. Y. C., C. B. & Q., and B. & M., have a somewhat similar foot in use), the slots in this foot to extend in depth seven-eighths of an inch, that is one-eighth of an inch inside of base of rail, width of slot to be eleven-sixteenths of an inch for a nine-sixteenth inch railroad spike, to have a good and tight fit when first put into use to under part of head of rail and top of base so as to give one-eighth of an inch space between its head and foot and the web of rail, and such radius used in its section corresponding to that of rail as to allow of the drawing in of the angle-bar towards web member of rail, its length to be twenty-four inches, suspended on two ties spaced eighteen inches centers, with four holes, center holes four inches centers, and end holes seven inches center. Slots of inside bar to be one and three-quarters inches from end ; of outside to be five inches from end, the holes in small bars to be round in diameter. Such angle-bars I believe will not break, and if the bolts are not allowed to be loose, and through a non-positive nut lock, allow expansion and contraction, with a proper allowance of labor at the joint and good ballast, the ends of the rails should remain in as good condition as the rest.

| NAME OF RAILROAD. | Weight of Rail. | Length of angle-bar. | Distance of center of holes. | | | Width of slot. | Depth of slot. | Position of slot to base of rail. | | | Above base of rail. | Even with base rail. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Center holes. | Middle holes. | End holes. | | | Even. | Outside. | Inside. | | |
| | lbs. | | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. |
| New York & New England | 75 | 24 | 6 | .... | 6 | $\frac{11}{16}$ | $\frac{11}{16}$ | .... | $\frac{1}{8}$ | .... | .... | .... |
| Concord & Montreal | 72 | 24 | 6 | .... | 6 | .... | .... | .... | .... | .... | .... | .... |
| Boston & Albany | 95 | 20 | $4\frac{3}{4}$ | .... | $4\frac{3}{4}$ | $\frac{12}{16}$ | $\frac{12}{16}$ | .... | $\frac{1}{4}$ | .... | .... | .... |
| Central Vermont | 72 | 20 | $4\frac{3}{4}$ | .... | $4\frac{3}{4}$ | $\frac{12}{16}$ | $\frac{12}{16}$ | .... | $\frac{1}{4}$ | .... | .... | .... |
| Richmond & Danville | 70 | 24 | 8 | .... | 5 | $\frac{12}{16}$ | $\frac{10}{16}$ | .... | .... | $\frac{3}{16}$ | $\frac{1}{4}$ | .... |
| New York Central | 80 | 40 | $5\frac{7}{16}$ | $5\frac{6}{16}$ | $7\frac{29}{32}$ | $\frac{12}{16}$ | $\frac{10}{16}$ | .... | .... | .... | $\frac{1}{2}$ | .... |
| Michigan Central | 80 | 40 | 6 | 6 | 9 | $\frac{12}{16}$ | $\frac{11}{16}$ | .... | $\frac{3}{16}$ | .... | .... | .... |
| Southern Pacific | 76 | 36 | $7\frac{1}{4}$ | 5 | 5 | $\frac{11}{16}$ | $\frac{14}{16}$ | .... | .... | $\frac{1}{16}$ | $\frac{1}{16}$ | .... |
| Savannah, Florida & Western | 75 | 48 | 6 | 12 | 6 | $\frac{10}{16}$ | $\frac{13}{16}$ | .... | .... | .... | .... | .... |
| Union Pacific | 75 | 40 | $5\frac{1}{2}$ | $5\frac{1}{2}$ | $7\frac{3}{4}$ | $\frac{10}{16}$ | $\frac{10}{16}$ | .... | .... | .... | .... | .... |
| Chesapeake & Ohio | 75 | 44 | 7 | 7 | 7 | $\frac{12}{16}$ | $\frac{12}{16}$ | .... | .... | .... | ... | .... |
| C. C. C. & St. Louis | 75 | 44 | 7 | 7 | 7 | .... | $\frac{10}{16}$ | .... | .... | .... | $\frac{1}{4}$ | .... |
| Boston & Maine | 75 | 40 | $6\frac{3}{16}$ | $6\frac{1}{2}$ | 7 | $\frac{10}{16}$ | $\frac{10}{16}$ | .... | $\frac{13}{16}$ | .... | .... | .... |
| Canadian Pacific | 72 | 44 | $5\frac{1}{4}$ | $6\frac{1}{2}$ | $9\frac{3}{4}$ | $\frac{12}{16}$ | $\frac{12}{16}$ | .... | $\frac{1}{8}$ | .... | .... | .... |
| Lake Shore & Michigan Southern | 70 | 48 | 6 | 6 | 11 | $\frac{12}{16}$ | $\frac{10}{16}$ | .... | .... | .... | $\frac{1}{16}$ | .... |
| Great Northern | 68 | 36 | $4\frac{1}{2}$ | $4\frac{1}{2}$ | 7 | $\frac{11}{16}$ | $\frac{11}{16}$ | .... | $1\frac{3}{8}$ | .... | $\frac{3}{64}$ | .... |
| Atchison, Topeka & Santa Fe | 66 | 38 | 5 | 5 | 5 | $\frac{12}{16}$ | $\frac{10}{16}$ | .... | .... | .... | .... | .... |
| Chicago, St. Paul & Omaha | 65 | 34 | 7 | 7 | 7 | $\frac{12}{16}$ | $1\frac{1}{4}$ | .... | $\frac{1}{8}$ | .... | .... | .... |
| Denver & Rio Grande | 65 | 40 | 6 | 7 | 7 | $\frac{10}{16}$ | $\frac{10}{16}$ | .... | .... | .... | .... | .... |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Missouri Pacific | 63 | 40 | 6 | 6 | 6 | $\frac{13}{16}$ | .... | .... | .... | .... | .... | .... |
| Cincinnati, New Orleans & Texas | 60 | 40 | $6\frac{1}{4}$ | 6 | $5\frac{3}{4}$ | $\frac{11}{16}$ | $\frac{14}{16}$ | .... | .... | $\frac{1}{32}$ | .... | .... |
| Chicago & Alton | .... | 40 | $7\frac{3}{16}$ | .... | 9 | $\frac{12}{16}$ | $\frac{12}{16}$ | .... | $\frac{1}{4}$ | .... | .... | .... |
| Concord & Montreal | 72 | 36 | 6 | .... | 6 | .... | .... | .... | .... | .... | .... | .... |
| Chicago, Burlington & Quincy | 66 | 35 | 7 | .... | 7 | $\frac{12}{16}$ | $\frac{10}{16}$ | .... | .... | .... | $\frac{1}{8}$ | .... |
| Maine Central | 67 | 29 | 7 | .... | 7 | $\frac{12}{16}$ | $\frac{10}{16}$ | .... | .... | .... | $\frac{1}{8}$ | .... |
| Philadelphia & Reading | 90 | 30 | 4 | 4 | 5 | $\frac{12}{16}$ | .... | .... | .... | .... | .... | .... |
| Pennsylvania | 85 | 34 | 4 | 5 | 6 | $\frac{10}{16}$ | $\frac{10}{16}$ | .... | .... | .... | .... | .... |
| Baltimore & Ohio | 85 | 30 | 4 | $4\frac{1}{2}$ | 6 | $\frac{11}{16}$ | $\frac{10}{16}$ | .... | .... | $\frac{1}{16}$ | .... | .... |
| New York, Lake Erie & Western | 80 | 30 | $4\frac{3}{16}$ | $4\frac{3}{4}$ | $4\frac{3}{4}$ | $\frac{14}{16}$ | $\frac{10}{16}$ | .... | $\frac{1}{8}$ | .... | $\frac{1}{16}$ | .... |
| Lehigh Valley | 80 | 30 | 4 | 4 | 5 | $\frac{12}{16}$ | $\frac{14}{16}$ | .... | .... | .... | .... | .... |
| Delaware & Hudson Canal | 80 | 30 | $4\frac{3}{16}$ | $4\frac{15}{32}$ | $4\frac{15}{32}$ | $\frac{12}{16}$ | 1 | .... | .... | .... | $\frac{1}{8}$ | .... |
| Central R. R. of New Jersey | 76 | 30 | 4 | 4 | 5 | $\frac{12}{16}$ | $\frac{14}{16}$ | .... | .... | .... | .... | .... |
| Central R. R. of Georgia | $68\frac{1}{2}$ | 30 | $4\frac{3}{4}$ | $4\frac{3}{4}$ | $4\frac{3}{4}$ | $\frac{12}{16}$ | .... | .... | .... | .... | $\frac{1}{16}$ | .... |
| Grand Trunk | 79 | 24 | 7 | .... | 6 | $\frac{10}{16}$ | .... | .... | .... | .... | .... | .... |
| New York, Providence & Boston | 78 | 24 | $6\frac{3}{4}$ | .... | $5\frac{1}{2}$ | $\frac{11}{16}$ | $\frac{12}{16}$ | .... | $\frac{1}{16}$ | .... | .... | .... |
| Old Colony | 78 | 24 | $6\frac{3}{4}$ | .... | $5\frac{1}{2}$ | $\frac{11}{16}$ | $\frac{12}{16}$ | .... | $\frac{1}{16}$ | .... | .... | .... |
| Fitchburg | 75 | 24 | 5 | .... | 8 | $\frac{12}{16}$ | $\frac{12}{16}$ | .... | $\frac{1}{8}$ | .... | .... | .... |
| Chicago, Milwaukee & St. Paul | 75 | 24 | $5\frac{7}{8}$ | .... | 6 | $\frac{11}{16}$ | $\frac{11}{16}$ | .... | $\frac{3}{16}$ | .... | .... | .... |
| New York, New Haven & Hartford | 74 | 24 | 5 | .... | 7 | $\frac{12}{16}$ | .... | .... | .... | .... | $\frac{1}{32}$ | .... |
| Chicago & Northwestern | 72 | 24 | 6 | .... | 6 | $\frac{12}{16}$ | $\frac{10}{16}$ | .... | .... | .... | $\frac{1}{4}$ | .... |
| Louisville & Nashville | 70 | $22\frac{1}{2}$ | $6\frac{1}{8}$ | .... | 6 | $\frac{12}{16}$ | $\frac{11}{16}$ | .... | $\frac{1}{8}$ | .... | .... | .... |
| Chicago, Rock Island & Pacific | 70 | 24 | 6 | .... | 6 | $\frac{10}{16}$ | $\frac{11}{16}$ | .... | $\frac{1}{8}$ | .... | .... | .... |
| Connecticut River | 70 | 24 | 8 | .... | 5 | $\frac{12}{16}$ | $\frac{12}{16}$ | .... | .... | .... | .... | .... |
| Illinois Central | 67 | 24 | 5 | .... | 5 | .... | .... | .... | .... | .... | .... | .... |
| Northern Pacific | 66 | 24 | $6\frac{1}{4}$ | .... | 6 | $\frac{12}{16}$ | $\frac{9}{16}$ | .... | $\frac{1}{8}$ | .... | $\frac{3}{32}$ | .... |

I would say that I used, on the road that I was formerly connected with, a one-tie joint with fish plate, and changed to a two-tie suspended joint with angle-bar. At the Washington meeting of the American Association I said I would try a three-tie angle-bar. I had one hundred tons of rail put in on the heaviest grade I had, to try same. Last Saturday and Monday I visited the road that I was formerly with, with Mr. Torr, who is present, to see how those joints were doing. I left that road a year ago last April, so that in what I say I can claim no credit for same. I took a straight edge and laid it upon the top of the rail. There was some sixty pound rail with a fish plate, laid in 1881, one-tie joint. I can say as to that rail you could not stick the thin point of your knife blade under the edge of the straight edge at the joint. I tried it on the two-tie angle-bar joint of 78-lb. rail, and I can say that was in as good condition, and on the three-tie joint of 78-lb. rail it was the same. I believe the reason is, that there has been a proper allowance of labor put upon those joints to maintain them. I looked at the surface of the rail. I will have to say that on the two-tie joints I could see a little dip, that would not be perceptible when you were riding over it; as regards alignment, I could see that there was a joint where those angle-bars were on the three-tie joint. On the one-tie joint of 60-lb. I did not observe it, and on the two-tie joint it was observable only a little. Now, in my paper, I state that I am in favor of a two-tie suspended joint. The reason for a change from a one-tie was the creeping of the rail that I wanted to prevent. I had had rails, as we used it with the fish plate, break from the slot that I put in the base of the rail. I thought that if I went and put a slot through that angle-bar at the center, using it as a one-tie joint, I should break same, and I wished to keep my ties from getting zigzag. There are roads that are using the one-tie joint, and I visited some of them. We will take the Boston & Albany road, which has used only a one-tie joint in their changes from one weight of rail to another—60, 72, and 95-lb. now. I asked their chief engineer, Mr. Russell, what they used now with the

95-lb. to stop this getting the ties zigzag, that I had had trouble with when I was using a one-tie joint, laying it broken, which I believe the New England roadmasters have adopted—the broken joint. He uses a check plate, which I think is of great aid to the one-tie joint. Now, this wave motion ahead of the wheel with the recoil behind it, not only one wave motion under a train, but those successive wave motions that are going on by the many wheels that are running so fast over same; and when they come to the joint, the question comes up, if we do not put a proper amount of labor to our two-tie joint, which I advocate the use of, we shall wear under the head where the blow comes—at end of the rails—if in which condition the angle-bar is worthless for the use it was designed. For that reason I would keep the angle-bar as short as possible. But on this three-tie joint that I put in on the Providence & Worcester, I will have to say they had broken some of them on the inside, because I followed what was talked at the Washington meeting, three slots in same, slot at the centre, which weakened it. I have spoken of the form of the angle-bar, which I think has a great deal to do with same, and most of the roads, as those blue prints of a few of the sections show, are getting into line of following the Fritz-Sayre pattern. I may be wrong in the conclusions which I have brought out in my paper, but I believe that the foot which extends beyond the base of the rail has a very great influence on the kinking of the rail joint. For that reason, I would bring the bottom of it up to the top of the base of the rail so it never should touch the tie. I think that when you do allow that foot to extend level with the base of the rail—and, as we will say, in the rush of renewing track we do not adze our ties sufficiently—we will get the entire purchase on the foot of that angle-bar, without having the base of the rail strike the tie at all, and the bolts that are put there for the purpose of keeping that angle-bar tight, become loose. I think you will all agree with me, that an angle-bar, of which the bolts are not tight, will very soon become useless, as well as the bolts that are in use with same. The slot, which was there for a purpose, I think, in a great many cases, has been made of not depth enough. In my case of the angle-bar that I put in use on my 72-lb. rail, I had iron all around the slot hole, making the slot hole three-quarters of an inch square. That slot hole did not extend in to the base of the rail. I can say from my experience with that angle-bar, in the rush of laying the rail, there being a hole for my trackmen to drive a spike in, sometimes they drove those spikes inside the slot towards the rail base, sometimes away from rail base, and when the wheels come along the tendency is to crowd those joints laterally. If the foot of your angle-bar is a narrow one, and the slot hole is too small, that slot will very soon wear a round corner on one side. I want to help the lateral pressure at that joint by having the slots of the outside bar nearer the joint. I believe in always having those slots extend in beyond the base of the rail in depth, so that in laying of the track the trackmen will drive the spikes in the slots against the base of the rail, and get his gauge at the joint the same as he does elsewhere.

Mr. F. C. Clark—I would like to ask Mr. Ellis about the size of the bolt that he would advise, whether he would increase the size or not with the weight of his rail, and with the angle-bar ?

Mr. Ellis—With the weight of the rail sections that are being used, and will be used, I should say increase the size of it. I think the day has come when we should step up into a seven-eighths bolt. And in that same line I want to bring up another point, that I have not stated in the paper. It is the expansion to be allowed when the rail is being laid, which will make a difference in the wear of your joint, the wear of your angle-bar, and, in some cases, I think, it will mean that they will not be broken. I believe that a great many times we allow too much for expansion. And on this question—I don't know whether it is pertinent to the same, but I think in the main it would be good policy—my idea is to have the rail always on hand in the spring, and as soon as the spring work is done to lay same. And I believe that three-sixteenths is what

I have allowed. And then, again, the taking care of that rail after it is laid, and getting the joint ties in as soon as possible, so that the running of the trains will not open your joints ; because you all know that when the joint is wide open, in our rush of work we do not respace those ties.

President—I would like to ask Mr. Ellis whether he would increase the size of the bolt, because I think we ought to bring that out very forcibly in this discussion.

Mr. Ellis—I should say yes with the 75 and 80-lb. I should give only seven-eighths now, but we should have that bolt of the best material. I notice Mr. Stevens here, and I will have to say a few words more. I have in the past on this floor advocated the trial and did use a bolt and nut without a nut lock, and I think Mr. Stevens questioned how I could afford to do so. At that time I used the Hoopes & Townsend bolt, paying the best price that was paid for any bolt, I think, that is made in the country. My bolts never broke, and I never stripped their threads. I will have to say that I notice on that road, that my successors now have nut locks on those bolts, and I will have to agree with them that I was in the wrong, that it took too much wrench work to keep them up. Then about the holes in the angle-bar—I believe in a round hole, I don't believe in the oblong hole.

Mr. Holbrook—I would like to ask what is the necessity of increasing the size of your bolt with the size of your rail ? The larger your rail the less strain there is on your bolt, the lighter your rail the more strain there is on the bolt. We must all admit that.

President—I will say in regard to that that I simply wish to get the opinion of the different members on that point. As well as increasing the size of the rail we are constantly increasing the load carried.

Mr. Holbrook—But the strain on the bolt is less on a 90-lb. rail than on a 40-lb. rail, very much less, because the rail deflects very much less, and that is the only strain on the bolt any way.

Mr. Lentell—That is what I was going to ask Mr. Ellis. It seems to me that with a heavy rail and a heavy angle-bar, the less strain he has on the bolt. If we do not have any trouble with the three-quarter bolt that is now used, why should we increase it? Certainly, if you have a larger bolt you have got to have a larger hole in your rail, therefore weakening it. I hardly see the want of it yet.

Mr. Stickney—I think you have use for a heavier bolt. If you have got a heavier thread and larger nut I think you can keep it tighter. With a light bolt you cannot have this thread and get as much service.

Mr. Holbrook—I don't deny that a heavier bolt would be a good thing, heavier, perhaps, than that which we now use. We have all seen the ordinary three-quarter bolt broken. But is that at all dependent on the size of the rail? Wouldn't you also use a heavy bolt with a light rail?

President—We would like to hear from Mr. Letchworth of the New York & New England.

Mr. Letchworth—I have not much to say. I think Mr. Ellis went over the whole ground.

Mr. Ellis—I think Mr. Letchworth could give us a little information. They are using a one-tie joint, and I have seen many that prefer the two-tie suspended, and the question comes up, or should come up, from what I have stated, as you go upon roads with the one-tie fish plate today and see good riding track, whether this two-tie suspended joint that we advocate the use of, has been in use long enough to show that it does give a support without something under that joint. He is using the one-tie joint, and for that reason I would like to hear from him.

President—I would like to hear from Mr. Letchworth for this reason: I think his experience would add to the information we have already gotten. The experience of every member is what we are after, not the experience of one, but the experience of all.

Mr. Letchworth—Mr. President, I will say this, that we have the suspended joint and also the one-tie joint. But I think, as a great many have said here this afternoon, it depends upon the ballast that you have under the rail to make the joint. In some places we have good gravel and in other places we have not. Where we have good gravel we have no trouble with it. In some places we have good ballast, but when you get over on the west end, where our ballast is not so good, we have a great deal of work to do to keep the joints up. And I think as the rest do, that it must also depend on the number of men you have to keep them up. If I have good ballast and the number of men required to put up track, I find no trouble in keeping it up.

President—Mr. Hammond, I think, knows something about joints, we have not heard from him.

Mr. Hammond—Mr. President, Mr. Ellis has told us about all that can be said about joints ; I have nothing further to say in regard to it.

President—Mr. Collins of the Old Colony road.

Mr. Collins—My experience with joints began, in a measure, with the old-fashioned cast iron chair ; then with the fish strap, later with the angle-bar. Now I am on the Boston & Providence Division with the Fisher joints in use, also the heavier steel angle-bar. Of them all, I very much prefer the 40-lb. steel angle-bar that the Old Colony is using with their 75-lb. rail, with the holes five inches on centres. And we are laying that suspended joint, which, with the experience I have had, I prefer to the supported joint. We get more help about the creeping of the rail. And also one little point which I have not heard spoken of to-day, in supported joints, sand and pieces of the tie get in between the rails, and there is no way of working out. With a suspended joint, with the contraction and expansion, that dirt drops out. That expansion and contraction we must take care of. In laying my rails I use, what brother Drew taught me, the iron shim, that I might know precisely what I was laying. We have that three-sixteenths iron shim. In very cold weather we increase the thickness to what in our judgment is necessary, but ordinarily a single shim is sufficient. In regard to the size of the bolt, we are using a three-quarter bolt and a one and three-eighths nut, not having much or any trouble with breakage. If we don't have any question about about its strength, why should we increase the size of the bolt ?

President—We would like to hear from Mr. Drew of the Old Colony road.

Mr. Drew—Mr. President, I don't know as I can say one word for your information, there has been so much talking upon this subject. I have angle-bar joints, mostly single tie joints. Most of my sections, I think, where it is good ballast, I can keep up better with a single tie than with a suspended joint, and as far as brother Ellis recommended, I have not used the angle-bar outside the base of the rail much. I wouldn't care if it went out two inches, it keeps from cutting in to the ties, and stops the rail from rolling out. The bolts are large enough now, only they are not of the quality of material that they ought to be. If the bolts were of number one material, they are big enough. On 130 miles I don't have a keg of broken bolts in a year. If we could have the outside angle-bar, and have it an inch and a quarter thick, I don't know of anything better than the angle-bar. But unless you have got very heavy rail for your suspended joint, I think the end of that rail will dip down with a spring joint. We have angle-bars punched at the end and some in the middle. Occasionally, of course, they break, and almost always break, not always, where the angle-bar is cut for the slot. I have always been in favor of a suspended joint, but a good many of my section men say they would rather have a tie right under the joint, particularly where the fish plates are used, of which I perhaps have got three or four miles, and they say they have less trouble keeping that up than they do where there is an angle-bar and suspended joint. I would say still further, we should have angle-bars of the best steel, and then I don't think there would be much trouble with their breaking ; and if they are to be suspended joints, of course to be slotted at the end ; if supported joints, slotted, of course, in the middle.

Mr. Letchworth—I will say one thing about that breaking of angle-bars. I have had a great many of them broken, and I brought them in and took them to the forge and had them bent. They broke right in two in the middle. We took them to the forge and bent them and we never broke them at all. I think as Mr. Ellis does, that the slot has a great deal to do with it, being in the centre. Then I think of another thing which causes it, the angle-bars not being bent when they are put on. Because I found in our own that where the angle-bar fitted on the rail then it did not break at all, but where they did not fit they broke right at the slot.

President—We would like to hear from Mr. Horner of the Rutland road.

Mr. Horner—Mr. President, we have not had as long experience up in western Vermont as many of these gentlemen. We were very late in getting steel rail, still later in coming to an angle-bar. I have been working for the last nine or ten years on a 56-lb. rail, with the light Samson plain fish plate, with a one-tie joint. It was so great an improvement on old iron with a cast iron chair, that we were very much pleased with it. We are now laying on my division the first heavy steel—72-lb. steel—with an angle-bar, which is an advance on anything we have had before. But I have learned a few things outside of my own division, by listening to other gentlemen, and by looking at their roads. I am satisfied that, even with our light rail and light plain bar, the bolt has been the weak point in the track; and it seems to me that with the increased strength and weight of the larger rail and the heavier angle-bar we should have either a larger bolt or a better bolt. I am satisfied that the bolt is inferior in quality. The new ones that we are using now sometimes twist off before we bring them to a bearing, and where they twist off they show defects, they show a seamy condition of the iron, black loose places—good ore, perhaps, but not sufficiently worked, made in a hurry, made at a low price. I am not disposed to blame anybody. On the bolt question I learned one thing last year, after being here at the convention. I met and talked the subject over with Mr. Turner, among others, of the Fitchburg road, and he showed me a steel bolt that he had taken out of a crossing they had been using on that road for some time, a three-quarter bolt, and he said they had never broken one of them. He kept or intended to keep at his office a report of everything that failed on the road, and the reason why it failed, as near as he could. He said there never had been one of those bolts reported broken, and yet they cost but little more than the ordinary iron bolt. It has been in my mind ever since, and I mentioned it to some of our managers. It seems to me that the present size of bolt is adequate if we can get an increase in strength by improving the quality. I don't see why it may not be done as well as not. That was his statement and experience. The bolt he showed me certainly looked well. I should be in favor of a suspended joint. I should be in favor of a short angle-bar, twenty-two to twenty-four inches, but I don't want any slots in it, I want spike holes inside and outside, so that you get the whole strength of your four spikes at every joint on each side, not only lengthwise but laterally. The way we spike the track ordinarily we don't get rigidity, it spreads a bit, it gets away from you. But if you can have a hole for your spike you get the full strength, no matter which way the train goes. You get the full strength of every spike in every joint, and they never get away from you. You will not find your plates lopping in or lopping out. I think the coming joint, the joint of ten years hence, will not be an angle-bar with a foot alone, but this foot extended out an inch and a half, perhaps, and then bent to have edges of foot come nearly together under the rail base, and so fitted that when the bolts are turned up properly to a bearing, you not only bind the rail between the base and the head, which sometimes splits the rail right through the holes, as you know, but you clasp the base of the rail outside and inside, top and bottom, so that you get the entire holding strength at the base of the rail, thus avoiding the splitting of the rail through the holes. Most of the rails that have failed—I have not had many fail, but those that have failed, have failed through the holes, and I think by the leverage or the strain at a loose joint or a low joint. It seems to me that before we reach perfection, we shall at least get so far that we will have a joint that clasps the rail in more ways than one, and that will not act as a wedge to press the base and head apart, but clasp the base as well, holding it down; and then, as I say, putting the holes through the base or the outer and inner edges of the joints, so as to get the full benefit of your spiking.

Mr. Ellis—Mr. Chairman, as I am an advocate of the short angle-bar, I would like to hear from Mr. George Nevins, as he has laid a three-tie angle-bar twenty-nine inches long, the shortest three-tie angle-bar in use.

Mr. Nevins—Mr. President, I have had some experience with a suspended joint, and have not had much success. I found that my rail dipped pretty badly, and when they they dip they pound, and when they pound our straps loosen. When we first used the twenty-nine inch angle-bar, they insisted upon our using a suspended joint, but I had to put under a third tie. I hauled my shoulder ties back so that the angle-bar set three or four inches upon same and put a tie under the joint. I got along pretty well, a good deal better than I did before. For the expansion I drove into the shoulder ties a spike at the end of the angle-bar instead of in the slot, and I got a very good joint out of it. And when we re-laid our steel with 72-lb. rail, I started with what we call the three-tie joint. I started in Portland seven years ago and drove the spike at the end of the strap, putting all three ties under. I have not seen but one pair of broken straps in the seven years. We have got a traffic of thirty trains a day, besides specials, and heavy engines. I find that we don't have any trouble in keeping our joints up with the three ties, and I find that the ties don't cut much, if any more, there than they do anywhere else. That is what led me to adopt the three ties, and we have had a very smooth joint.

Mr. Ellis—How many holes in the angle-bar?

Mr. Nevins—Four holes, and the rails are just as secure at the ends as the day they were put there, no dip whatever. Holes seven inch centres all around. Now as to a wide strap, I don't believe in it, and I will tell you why. The further you get beyond the base, the more strain you will throw on your bolt, which tips your strap and it is but a little while before you begin to hear it rattle, and it will strip the whole length. But the higher you can get your rail, and the deeper you can get your strap, the better joints you have got. And as to the bolt, we use a three-quarter bolt and a three-quarter nut. We have very poor luck in getting good bolts, they are very bad. They trouble us a good deal by breaking. But I should say that a seven-eighths bolt and a three-quarter nut, as a rule, would be better, and have them first-class in every respect.

President—Did I understand you to say you were using a three-quarter bolt ?

Mr. Nevins—We are using a three-quarter bolt.

President—And you recommend what ?

Mr. Nevins—I would recommend a bigger bolt.

President—Seven eighths ?

Mr. Nevins—Seven-eighths, yes, but I think that they should be made of the best quality, and of the best workmanship, if you are going to have good results. I think Mr. Ellis has rode over our road, and seen some bad suspension joints, but to cure that I put three ties under it.

President—We should like to hear from Mr. Jackman of the Northern road.

Mr. Jackman—I don't see that I can add anything to what has been said. I have had some experience with the suspended joint. I think three ties and an angle-bar are better than a suspended joint. I would rather take my chances on a supported joint than a suspended one. We tried the suspended joint, and couldn't keep it up as well as we could the supported one, it may have been on account of the poor ballast. We are now laying a supported joint and angle-bar, and we like that better.

Mr. Ellis—Now that Mr. F. C. Clark has returned, I will say that I noticed on his road that he had two-tie and one-tie joints in use and should like to hear from him ; where we have planking at crossings and at platforms, we—I won't say that he does, I know I did—procrastinate some about the care of those joints in those places, and that there the joint would become crippled, from not taking up the plank as often as we ought. As he has two-tie and one-tie joints in use, I would like to have him state whether at those places the suspended two-tie or the supported one-tie joint will keep up the joint, where through neglect, procrastination, or want of labor, they have not received the attention they should have had ?

Mr. F. C. Clark—Mr. President and brother members, I don't feel very much like talking, as I hardly feel like sitting up, but inasmuch as Mr. Ellis has called upon me, I will try and say a few words concerning the two joints mentioned, first, however, stating that the compliment which he endeavored to pay me, I think I could return. Now in regard to the distinctive difference or to my favoring one joint above another, I must say that I prefer the two-tie joint. It is in opposition to what I have previously expressed here, but as improvement is the order of the day, I accept the report and certain statements that are contained in the report of the committee on track joints. If you will allow me kindly to read just a word under article 9, where it says : "A joint needs support underneath more than sideways, and why not give it the support it needs by putting a plate under it, or some other proper support ?" That is very good, but somewhat indefinite. One brother expressed himself on the floor this afternoon to the effect that he didn't like the tie under the joint, inasmuch as fibres of the tie, gravel, etc., would work up between the ends of the rail, because it couldn't go the other way. Now, then, if you put a plate underneath there are no fibres of the ties, but all dust, etc., that collects in there has no way of working out. We have been out in what our President has termed the ante-room, and have been looking at the different styles of track joints, and different method of supporting and reinforcing those joints where they are suspended, in order to give them sufficient strength. It is a question that I shall not attempt to decide fully, because I can't do it. I don't know how. Later on, when the decision is rendered upon this report, we must look well to those different methods and those different inventions that are presented here, and see which one comes the nearest to filling the bill, as stated by the chairman of the committee, or rather by the committee as a whole. A little further on in this report our committee say, "Joints should have as few parts as possible." Now, then, if we are going to have a plate and a support, I should most heartily agree with the remarks of our brother Horner, of the Rutland road, in which he would turn the angle of the angle-bar over around the base of the rail, and underneath, bringing it together to within, perhaps, an inch, to give sufficient strength in your angle-bar, that your joint may be the strongest part of your rail, if it can be, and I certainly believe it will. Nothwithstanding the very fine criticism of the joints in our crossings—and I have nothing to say, I plead guilty to the charge, undoubtedly correct—I must say, that where those angle-bars were used, similar to the pattern that I have tried to explain to you, I doubt if he could find a low joint. He might find in the general surface of the track a joint that was a little low, but I doubt if he could find one single joint that was low, except it was in connection with a slight sag, we will term it, in the track. Another thing that was mentioned by the committee was, something to prevent this motion of the rails on curves, which is fully accomplished by using those plates, I believe, and I am most heartily in favor of it. I have changed my mind in regard to many things, but I am obliged to continue my testimony in regard to this, until I see something better. I have seen some inventions here that looked very well ; but everything looks well when it is new, and we may not be able to judge until we have tested them. I do believe, however, in the suspended joint. One question I would like to ask of the gentlemen who have been talking here concerning the relative size of bolts. We have doubled, yes, trebled, the weight of our engines. We have not doubled the weight of our rails, unless it be in a very few instances. Whilst doubling the weight of our locomotives, I would like to ask those gentlemen who belong to the engineer corps of this convention, if we have kept pace with the increased weight in the reinforcement of our joints, in the strength of our bolts? It has been well said, if you can always get the best material it may do. You could get at one time better material in your rail, when you were getting 56 and 60-lb. rail, than you can now. And that brings us to another question, although it is digressing slightly from the subject, and that is, heavy rail is a harder rail to get of even temper all the way through. Your quality will not be the same. But in regard to bolts, it does not follow that you cannot make a seven-eighths bolt or an inch bolt of just as good material and just as strong as you can one that is only three-quarters of an inch in diameter. I believe, however, that we should have our angle-plates properly made, so that our joint will be as strong—yes, it wants to be stronger, and must be—as our rail, determined either from experience, or from an engineering test, as they know how to get at the ductile point of iron and steel and can figure out and tell us how much is required, how large a rod must be to sustain a given amount of pressure, how large a bolt you must use, how thick the nut should be, what size a plate should be, etc., in order to give you sufficient strength. That is what we want, we want something that is strong and durable. If we haven't got it, we must look for it. That is the reason why we are here together this afternoon, discussing this question. But, as I said in the first place, give me a suspended joint, but give me something with which to suspend that joint that shall make the joint as strong, yes, ten per cent. stronger than any other part of the rail.

Mr. Shanks—It has always been customary in previous meetings of this Association, to hear from our Secretary. I think we would like to hear from him now.

Mr. French—Mr. President, I was just thinking as Mr. Shanks spoke, that we have out there in the other room, half a dozen different samples of the joints we are talking about; and as it is getting so dark in here and they have light out there, I should like to make a motion that we adjourn to the other room and look over those joints carefully, and then this evening continue this discussion, talking understandingly, about the joints we have there and the merits of them. I would like to say just one word more before we adjourn—if those members who have not paid their dues will please pay at the end of this meeting, it will come in most conveniently. It is the best time, I think, now.

Mr. Shanks seconded the motion to adjourn, which was carried.

## EVENING SESSION.

The President called the meeting to order at 7.30 P. M.

President—I am requested to call upon Mr. Torr in regard to this joint question, and also requested to ask him the comparative cost of the two-tie joint and the three-tie joint, of the two-tie suspended and the three-tie supported joint, the cost of labor on each.

Mr. Torr—The two-tie will cost more.

Mr. Ellis—As the three-tie angle-bar and the two-tie that he speaks of are the ones that I put into use, we are led by his statement to believe that he favors the three-tie supported, when cost of maintenance is considered. Are there not some gentlemen present who have had the one-tie supported and the two-tie suspended? I judge that there are a great many in favor of the two-tie, and yet I see that they admit, as I did in my paper, that there was a dip at the joint. I am talking of the angle-bar now in use, whether after you get it laid, the cost of maintaining it, as suspended, is greater than when it is supported.

Mr. F. C. Clark—Mr. President, I notice a gentleman in the room who was our presiding officer last year—I would like to hear from Mr. Bishop.

Mr. Bishop—Mr. President and members, I don't think that there is any use of my discussing this track joint question. I am on record, and my opinion will hold good yet, I have not changed my views at all. It has been a sort of a joke on me at these conventions to get me up to discuss joints, and I believe I won't say anything now.

Mr. F. C. Clark—I will say that I did not call upon Mr. Bishop as a joke, but simply to have his opinion and experience with the suspended joint; it don't matter how it is suspended, if it is the Clark-Fisher, or the angle-joint, or any other method that you please.

President—Also whether there is any improvement to be made on the present angle-bar and joint that he is now using?

Mr. Bishop—Mr. President, I would say that I received this year ten or twelve miles of new rail to be laid with the angle-bars. I have laid three-quarters of that now, it has been in the track some three or four weeks. Of course it does not come natural, like everything else that is an improvement over the old. I think we have a very good joint at the present time, and as I said before, that the suspended joint that we have been using for years past is the one I should prefer. I have noticed in using angle-bars in the past, that they commenced at the top and broke down towards the base. These that we have now of course have not been in service long enough to know whether we shall get any such results from them or not.

President—Do you think that the bolt is sufficiently large? I suppose you are using a three-quarter bolt?

Mr. Bishop—Yes.

President—You think that is ample, do you?

Mr. Bishop—I think the bolt is in advance of the rail in strength, yes. I would say that on the Worcester division I have perhaps ten miles of the old fish strap joint.

President—Plain fish plate?

Mr. Bishop—Plain strap. Last winter I used to find a great many of those joints broken right in two at the bolt hole, showing that the bolts were stronger than the straps.

President—Mr. Hyland, of the Cheshire road, we should like to hear from you.

Mr. Hyland—Fitchburg, please.

President—Excuse me, Fitchburg.

Mr. Hyland—I have not much to say on this joint question. We are using and have used both of the angle-bars, both the supported and the suspended with longer bar. I prefer the suspended joint to the other, have less trouble with it, and have a better track with the same amount of labor. Of course in putting in ties you get two ties under a suspended joint to one under the other, but you don't get any more ties in the whole 30-foot rail with that than you do with the other one. They have given us better satisfaction—that is, the suspended joint has—than the supported.

President—Yours is a single tie ?

Mr. Hyland—A single tie, yes, a single tie and a short bar. And the trouble Mr. Collins speaks of we have often had, that where the sand drops down through the joint, there is no chance for it to get out, and it will cut out nearly two ties to one elsewhere, and don't stay up as well. We have better success with the suspended than with any joint we have ever used. Of course it is on a heavier rail than the fish strap was or the Fisher joint.

President—Could you suggest any improvement in the present angle-bar as you now use it ?

Mr. Hyland—I presume there could be improvements, but it is perhaps the best joint we have ever used. We have never had any trouble with the breaking of bolts, the bolts are large enough, and the nuts are large enough. Lack of good material, is the great trouble with the bolts.

President—Mr. Smith, of the Boston & Maine, is with us now, and we would like to hear from him.

Mr. Smith—We are using the angle-bar with 76-lb. rail, which we have laid this summer, and have not had trial enough of it yet to know what is going to come of it. It is supported, and stays up well. We have had to use three ties, one under each end and also at the joint; we don't lose any strength there. We think it is a very nice joint, and that we are going to like it.

President—Is your angle-bar slotted at the ends ?

Mr. Smith—At the ends.

Mr. Horner—I would like to add just a few words of experience to what I said this afternoon on this subject. Sometime ago there was quite a quantity of steel sent to me, without any punching in it whatever. We attempted to punch it on the ground, but did not succeed very well, and we finally got it in as best we could. A portion of it was on a grade, and it kept running and creeping until it got over eight inches from where I laid it. Many of the joints were off the tie, some were on a tie, but quite a different tie from that which they were laid on. Of course it suffered somewhat, and the joints became battered, and a great many of them were down. After a great deal of corresponding and talking about the matter, I got last year a small quantity of angle-bars, punched for a suspended joint, for two ties. We went to work and re-laid that four miles of track where it belonged, put under two ties instead of one, and put on these angle-bars, and had a suspended joint. It has really renewed those rails, they look very much better than they did, and they stay in place very much better than any joint I have. The foreman of the section is wonderfully pleased with them, and thinks that if he had all his track laid that way he would be very much better off. So that what little experience I have had with the suspended joint has been very favorable. I like the suspended joint, but I should want two good ties under it, and not have them very far apart—a good swing joint, well spiked, with holes instead of slots, as I have once said.

President—I would like to hear from Mr. Greer, of N. Y., N. H. & H. R. R. I think he has had a great deal of experience, and some of it would be valuable for us to listen to.

Mr. Greer—I think the subject of angle-bars has been fully discussed. I have had no experience with the three-tie supported joint at all, only the angle-bar proper with two ties. The only trouble I find in my division is with that which was laid previous to this year, that the angle-bar was too light, and made of too poor material, so that they would both bend and break. The new angle-bar that we are laying weighs forty pounds to a pair, made of steel, which we think is a great improvement, and I believe it will hold it up with proper care. I have seen the supported joint. It has some merits, but I don't know as it is worth while discussing it, because gentlemen are right here who can ably present their side. There is one thing that I do prefer the angle-bar for, and that is this: Ties are ties, every time. It is a pretty nice thing to get a tie that is from ten to twelve inches face, to put under an angle-bar or a joint of any kind to support it. Now, if we lay two ties that have got seven, eight or nine inches face under a twenty-four inch plate, we certainly present a larger surface. That is one of the things I like in an angle-bar. But of all things have it strong enough, in which I don't think we are up to the times yet, unless it is the new angle-bar of the B. & A., which I think comes the nearest to my idea for strength, of any that I have seen yet.

President—Then, you would advocate increasing the strength of the joint all around ?

Mr. Greer—I would, certainly, by all means, and not have it any longer than twenty-four inches, either. That is my experience.

President—We should be pleased to hear from Mr. Sibley, of the N. Y., N. H. & H. R. R.

Mr. Sibley—Mr. Horner says he fastened his rails to prevent them from creeping—I would like to ask him if he kept them entirely from moving, and if so, supposing he had his track laid broken joint, how he kept his ties from twisting around. I have been greatly troubled on heavy grades—we have some quite heavy grades—in keeping our ties square, where the track is laid broken joint. So that on some of these grades I have laid new track square joint, partly on account of keeping our ties square. We have tried several ways of holding them, and been unable to keep them square. Of course, with the angle-bar I advocate a broken joint, a suspended joint, but with the fish plate a supported joint with one tie. Our Secretary says we have a suspended joint any way, but if we have that joint properly taken care of, I don't think it would be suspended. I don't intend to have my track so that the fish plate joints are suspended.

President—Are the present angle-bars heavy enough, Mr. Sibley, do you see any need of improvement there ?

Mr. Sibley—We have had some angle-bars with 60-lb. steel where the angle-bars have broken, but they were very light. The ones we are using at present are thirty-four pounds to the pair, I think. I have not had any trouble with them of any kind. We have laid about five miles this year of same.

President — Mr. Hathaway, of the Connecticut River road.

Mr. Hathaway—Mr. President, my experience is so limited that I beg to be excused on this question.

President—Mr. Lavoix of the Boston, Revere Beach & Lynn R. R.

Mr. Lavoix—I have the supported joint and the suspended joint, and the supported joint gives us the best satisfaction on our short road. I use the angle-plate, with a hole punched right through the plate ; there is no slot cut in it, but a hole punched right through. It keeps the rail from canting to have them punched in that way. I get a better result from the supported joint than I do from the suspended joint. That has been my experience with the angle-plate.

Mr. F. C. Clark—Mr. President, I would like to ask one question of Mr. Bishop. If I understood him correctly, he noticed that the angle-bars that would break, commenced at the top—am I correct ?

Mr. Bishop—You are.

Mr. F. C. Clark—I would like to know if you can give any reason for their commencing at the top, or if any member of the Association can.

Mr. Bishop—I have a reason for my opinion. It being a suspended joint, the ties would act as a fulcrum, and the rail as a lever, and when the second or third ties become loose or decayed, the wheels bearing the rail down at that point, would open the joint at the top. That was quite a conundrum to me for some time, and I stood beside the joints and watched them with the wheels passing over them, and that was the way it worked. The rail would depress on the second or third tie, force open the joint at the top, and the angle-bars would break from the top down towards the base.

President—Mr. Braley, of the Old Colony road, we would like to hear from you.

Mr. Braley—I guess I will let the other brothers tell the story.

President—You must have had some experience, and every man's experience helps the whole.

Mr. Braley—Well, they have told the story, I think. Brother Collins told the story all right.

President—Mr. Bryant.

Mr. Bryant—Well, I think that Mr. Collins represented the Old Colony road pretty well. I feel very well satisfied with the joint we are at present using.

President—Are there any improvements that can be made ? That is what we wish to get at, any way in which we can improve the present joints.

Mr. Bryant—Well, as I have said, I am pretty well satisfied with the joint we are at present using.

President—Mr. Brennan.

Mr. Brennan—Mr. President, I have only just come in, and have not caught the drift of the discussion.

President—The discussion is on what improvements can be made on the present angle-bar, and if there are any to be made, and your experience in keeping up joints.

Mr. Brennan—My experience is rather limited. I will give my testimony as approving of a suspended joint. I was going to say that I have never in my experience seen an angle-bar or a fish plate strong enough proportionate to the rail. Further than that, I have nothing to say in regard to the matter.

President—Mr. Stone, of the Boston & Albany, we have not heard from you on this question; we should be pleased to.

Mr. Stone—I think Mr. Lentell spoke this afternoon, and I approve of what he said. We have never had any experience with anything but the one-tie supported joint, that is all we have used on our division. We like that very much.

President—You have used lighter rail, not the 95-lb.?

Mr. Stone—We have used this one-tie joint with everything, 60, 72 and 95-lb.

President—On your division you use the lighter rail?

Mr. Stone—No.

President—You use the 95-lb.

Mr. Stone—Use the 95.

Mr. Ellis—Mr. President, cannot Mr. Stone answer the question put by Mr. Sibley in regard to holding ties from getting zigzag?

Mr. Stone—We use this check plate, similar to what Mr. Ellis has shown on the table here. We have used that on a 72 and 95-lb. rail.

Mr. Ellis—Mr. Chairman, in addition to that check-plate of the B. & A., which was one they got up themselves, the C. B. & Q. road use a pair of 5-inch long angle-bars, bolted by one bolt to the middle of the rail opposite the joint, the ends of these short angle-bars projecting by each other for proper spiking at slots in same. I noticed these in walking over their track, which I think is another good way to keep ties square on a grade where a broken joint is used.

President—We have several new members here, and we should be pleased to hear from any of them. Mr. Sisk of the New York & New England, Mr. Richmond of the same road, Mr. Muzzey of the Boston & Albany.

Mr. Muzzey—I am not familiar with the discussion at present, and will wait a little further. I have just come in.

President—The discussion is on the angle-plate or joint, what defects you find in it, and what improvements you would suggest.

Mr. Drew—Mr. President, I have 132 miles of track laid about ten or twelve years, and have the swing joint, as we call it, the suspension joint, and the rigid joint, and never had an angle-bar commence at the top and break down towards the base, only where the steel flange of the wheel comes so close, if it did not fit in under the ball of the rail it would wear it off a little, but no sign of it breaking down. My idea, as far as improving it goes, would be to have it made of better material, and then I will risk the angle-bar on fine sand or coarse ballast. Of course, coarse ballast is the best. Some members here would rather have a rigid joint, but I have always gone for a swing joint. For thirty years we kept the joint by hard work right up to the handle with the old fish plate; now that has gone by, and angle-bars have come in.

President—Are there any other members here who have anything to say in regard to this matter. We would like to hear from anybody and everybody.

Mr. F. C. Clark—Mr. President, I have a resolution to offer, not to make any comments, with one exception. I would refer to the remark of brother Drew when he was on the floor before we went to tea. He said he would not mind having the foot of the angle-bar extend out even two inches beyond the rail, as it gave greater support, and prevented the rails turning over. I once had a little experience with an angle-plate that approximated two inches, but did not quite reach that point—I don't remember just the distance, but I should judge about an inch and a half—and I found a great many of those rails wore into the tie, the foot of angle-bar turned up, and broke off entirely. With that I would offer the following resolutions, which may, perhaps, bring some of you to your feet again, if the ideas do not strike you favorably. Resolved, that it is the sense of this convention that a suspended joint is superior to a supported joint. Resolved, that the present angle-bars require more material in their manufacture, or to be so shaped as to give greater vertical strength.

Mr. French—I second the motion.

Mr. Collins—Mr. President, in regard to that resolution of Mr. Clark's, about more strength in angle-bars, he should specify a little more clearly which angle-bar he refers to. A good many have the 33-lb. angle-bar, and the Old Colony to-day are using the 40-lb. angle-bars. There we have additional strength.

President—This, as I understand it, applies to those that discover weakness in their present angle-bar.

Mr. Collins—Then, you are talking about the 33-lb. bar?

President—This means in general, but don't include the latest designs, the best angle-bars, they may be strong enough.

Mr. Collins—There is quite a difference between the two, especially if one is made of poor iron and the other of good steel.

Mr Hyland—Mr. President, I think that brother Collins' point is well taken. I think the resolution reads our present angle-bar. Now, if that doesn't cover the latest designs, what would ?

President—You can amend this resolution to suit yourselves after it is talked over. We will get it before the meeting, and then doctor it, if you will.

Mr. F. C. Clark—I would say that the resolution has accomplished what I designed it should. I thought I could get you to work in one way if I could not in another. I would add further, Resolved that a practical test be made of our present size of track bolts to ascertain if they are adequate to the increased strain put upon them by the greatly increased weight of our rolling stock. I will say, further, that it was my design in that resolution to cover all angle-bars in use. If we have any members present who have an angle-bar that is sufficiently strong at all times and in all places to maintain their joints, it is all that is required. What we want is proof that we have them, and any brother roadmaster here who has them is fortunate indeed. He ought to be proud of it, and I am glad he has them. We want to get them. If you have the 40-lb. bars, and those sustain the weight, and are adequate and sufficient, it may be all that we require. If I remember rightly, brother Collins is using the three-tie angle-bar.

Mr. Collins—No, sir, the suspended joint, the two-tie.

Mr. F. C. Clark—I beg your pardon. It is not the first mistake I have made, and probably won't be the last. So many gentlemen have spoken in favor of this, and I had it in mind that you were one of them. I would ask Mr. Collins if he has ever discovered any signs of weakness, and how long he has had in use the 40-lb. angle-bars?

Mr. Collins—We have used the 40-lb. two years. I have not discovered any weakness yet. They are doing much better service than those of 33 and 37-lb to the joint. That is why I wanted to have a distinction made between what we have now and what we were then using. I think all of our broken angle-bars have been in that light bar; in my experience I have not seen a broken steel one.

Mr. Hyland—I don't know what Mr. Clark would require to prove that the angle-bar was sufficient to carry the load. I don't know, but I will say for ours we have a 33-lb. and a 40-lb., and we never had many of them broken of either kind. The 33-lb. are on the 72-lb. rail, and the 40-lb. are on the 72-lb. and 76-lb. rail, and we never had six broken bars on the road in the ten years that we have used them. I don't see why they are not adequate to do the business, if they don't break.

Mr. F. C. Clark—Mr. President, I would ask either of the two gentlemen if they have discovered at any of the joints the slightest battering of the rail at the end?

Mr. Hyland—We had one lot of rail that battered before it had been in a month; other than that we have not. That was soft.

Mr. F. C. Clark—How long has it been in use ?

Mr. Hyland—It has been in use three years, and is not a great deal worse now than it was when it had been in six months.

Mr. F. C. Clark—Inasmuch as the resolution was not before the meeting on a motion, as it would have to be before it could be properly acted upon, I will substitute the following : Resolved, that our present angle-bars under forty pounds in weight—you might make it less, you can if you see fit ; the resolution can be brought before the house, and then can be amended—require more material in their manufacture, or to be so shaped as to give greater vertical strength. Then the second resolution was : Resolved, that a practical test be made of our present size of track bolts to ascertain if they are adequate to the increased strain put upon them by the greatly increased weight of our rolling stock.

Mr. Collins—Mr. President, Mr. Braley has some rail laid in 1883, 67-lb. rail, with the angle-bar—I would like to ask him if he has seen anything of the battering of the end of the rail that Mr. Clark speaks of. He has 35-lb. angle-bars.

Mr. Braley—We laid that with Washburn steel, which was very soft, and on the double track it did batter a little. That was a short time after we laid it, and I don't know that it is much worse now. But we had no trouble with the angle-bars, the angle-bars are all right.

Mr. Shanks—Mr. President, I would like to ask some of these gentlemen who have the angle-bar, if it is not a fact that those angle-bars between the ties do weaken with the heavy rolling stock passing over it, where it is suspended.

Mr. Braley—I can say for one, that I don't think our 24-inch angle-bars do, that weigh forty pounds. We have got nearly eleven miles of 78-lb. rail, with those angle-bars on, and I don't think you will find any of the joints that have flinched with respect to the strength of the angle-bars, and I think we have pretty heavy traffic.

Mr. French—I move that we adopt that resolution of Mr. Clark's.

President—Gentlemen, this resolution is before you now for amendment.

Mr. Shanks—I second the motion.

Mr. Clark—Mr. President, I wish to say just a few words. I am not thin skinned in the least ; it won't disturb me a particle to have you vote down any resolution that I may present to you. I have always told you whenever I have met you here, that we want the best that we can get. I want every member to be fully persuaded in his own mind, and vote in accordance with his experience and opinion. Year by year we advance step by step. We believe it is a good thing for the railroads of New England ; and if I may credit what I have heard this afternoon, it is a good thing for the roads all over the country, that the New England Roadmasters' Association exists today. Its influence is perhaps stronger than that of any other association of roadmasters on this continent. And now I ask each of you, as individuals, to vote for himself, vote to sustain or reject ; or it is perfectly proper for you to amend, and I should be glad to have you do it. Get it right, so that we may go upon record as sustaining that which we know or believe to be right.

Mr. French—I wish Mr. Clark would read that once more.

Mr. Clark—The resolution is as follows : Resolved, that it is the sense of this convention that our present angle-bars under forty pounds in weight require more material in their manufacture, or to be so shaped as to give greater vertical strength. Resolved, that a practical test be made of our present size of track bolts, to ascertain if they are adequate to the increased strain put upon them by the greatly increased weight of our rolling stock.

Mr. French—Mr. President, that seems to make it the voice of the convention that the angle-plate is *the* best joint, that is, that will be *the* joint of the future, when its vertical strength is increased. I think the first part accords with my ideas that the suspended joint is better, but I don't believe that the plain angle-joint is the best joint. I think that in a joint like the continuous rail joint, there is the right idea. Almost all of these new joints in the other room are two-tie joints, but they all offer a support for the rail ends, and I think there should be such support. This feature of a bridge in a joint to carry over the weight which comes on the rail ends I like, and the continuous rail joint as well as several others in the market, furnishes a splendid resistance to the forces which depress the rail ends.

Mr. Clark—Mr. President, I think the gentlemen do not fully comprehend the meaning of the resolution. In the first place, I merely declare that a suspended joint is preferable. I do further, and simply declare that our present style of angle-bar, under a certain weight, is not sufficient or adequate to its duties, unless it is so formed as to give greater vertical strength. Now, it matters not, as our President has well said, whether the angle extends out straight, or whether it turns under the rail. You may, of course, amend or add to it. I don't ask any member here to vote for those resolutions. I make them in order to draw you out. But I believe that the distinction is there, and if you vote to sustain those resolutions you are not voting to sustain the angle-bar. It matters not, because there is a distinction between the two. The first one simply consists in a suspended joint. The second goes on simply to declare that angle-bars must be made heavier than most of us have. Possibly some of you have those that are sufficient and are good enough, but I believe that we shall find that there is something better. And as we come together and find out these facts, it goes home sometimes ahead of us, it gets there before we do. I have found some good resulting to the road that I am connected with, on account of the discussion and decision at these meetings.

Mr. Drew—I agree with brother Shanks. I don't believe that it would be good common sense for all these roadmasters here in convention to resolve that a suspended joint was the best joint; because probably common sense would teach that a rigid joint was quite as good. There are joints out in the other room that are going to be way ahead of the angle-plate joint.

President—As I understand it, those joints out there are different forms of the suspended joint or the supported.

Mr. Drew—Certainly. But there is going to be something better by and by ; it will cost, perhaps, more money, but it is going to be better.

Mr. Clark—We mean by a suspended joint any joint that has not a tie under it, anything outside of a tie.

President—Does any other gentleman wish to say anything ? If not, we will put this upon its passage.

Mr. Collins—Why not take those resolutions up one at a time ? Perhaps some would like to vote in favor of one and not the other. The first one I am heartily in favor of.

Mr. Clark—The first resolution reads : Resolved, that it is the sense of this convention that a suspended joint is superior to a supported joint or a rigid joint.

Mr. Shanks—By a suspended joint we understand that it is to be some form of an angle or a support underneath ?

President—Yes.

Mr. Clark—Before that question is put, I would like, in order to guard against any further criticisms—if the gentlemen who moved and seconded the motion will accept it—to substitute the following : Resolved, that it is the sense of this convention that a suspended joint is superior to a joint supported by a tie.

Mr. French—I think that improves it.

The resolution as last read was thereupon accepted, and the motion to adopt it put and carried.

President—The second resolution.

Mr. Clark—Second—Resolved, that the present angle-bars under forty pounds in weight per pair, require more material in their manufacture, or to be so shaped as to give greater vertical strength. It does not declare that to be the best joint.

Mr. French—Can't we amend it so that it will read a better support at end of rail? I want a suspended joint, but I want a support under the rail ends, but no tie there.

Mr. Bishop—I shall vote in favor of this resolution, with this understanding, that in a suspended joint there shall be two ties.

President—That is correct.

Mr. Bishop—And not one under the end of the rail.

President—That is as we understand the resolution, a suspended joint of anything you see fit.

Mr. Bishop—I don't approve of a joint where the whole strain comes upon the head of the rail. You might as well take the base off then, you have no use for it.

President—It is simply a question of being supported or suspended. Does anybody second the resolution?

Mr. Shanks—I second it.

Mr. Bishop—I would like to know what the second clause is?

Mr. Clark—Resolved, that our present angle-bars under forty pounds in weight per pair require more material in their manufacture—that is, increase their weight—or to be so shaped as to give greater vertical strength. Nothing there in favor of the angle-bar, only that the angle-bar that we are now using must be re-inforced in its strength.

Mr. Holbrook—He says, under forty pounds weight—does that confine itself to any length?

President—That is as I understand it, of the length generally used on the two-tie joint.

Mr. Bryant—That is, twenty-four inches?

President—Yes.

The resolution was then put and adopted.

President—Now the third clause.

Mr. Clark—Resolved, that a practical test be made of our present size of track bolts to ascertain if they are adequate to the increased strain put upon them by the greatly increased weight of our rolling stock.

The resolution was put and adopted.

Mr. Collins—There was one remark of Mr. Clark's that pleased me very much, and I don't know as he little knew how near it came to the truth. He spoke about the influence of this body. I was very much surprised myself last year, the very next day after our meeting, to have our general manager call my attention to something that was said here, and ask why we hadn't done it. He had followed us through. He saw the suggestions, and he wanted them adopted. As it is with the Old Colony it seems to be with the other roads.

President—In connection with that I would say with regard to our superintendent, Mr. Mulligan, we had a little accident on our division, and it was through my neglect or the neglect of a section foreman. He went to one of these books, picked it up, and said to me that I had neglected to do what I advocated in these meetings, showing that he was keeping pretty close track of me. Since that time I have tried to live up to what I have talked here.

Mr. Clark—Mr. President, not only here, but I have it from gentlemen way out almost to the Rocky Mountains, that even out there, railroad managers are looking up to see what this Association is doing. I don't know why, unless they think that New England men, in a New England Association, with New England energy and New England push, get nearer to the facts ; that they attended the convention out there for this one object, not to view the Rocky Mountains ; I went out there once myself, and enjoyed the beautiful trip, but during the week, with the exception of a very small portion of it, I was not discharging my duty to the railroad company that pays me for my services, as I am when I come to this Association, and when we unite our ideas together, that is to say, you criticise what I do and say, and I criticise what you do and say, and therefore it stimulates us to test the experiments, to test the inventions that are put before us. Now we have a large number of those men who have come here to help make it interesting. They come here because they expect that their firms will make a dollar out of it. It is perfectly just and right. And mark this, that the life of our Association depends upon perfect harmony existing between the members of this Association and the men who by their presence, by their encouragement, by the display of their inventions, help us in our onward career, that we may get at the best. As you have done me the honor to elect me your next president, I want to thank you for it, as I may not have another opportunity. Although I expect to make a great many mistakes in filling that position, I want to tell you one thing, that I hope every member that is present here at this convention will be present one year from now ; not only that, but I hope that each one of you who has got a roadmaster near, who is not here, will use his influence to bring him here, and with all my weakness I will have the heart to do the very best I can to make it interesting for you. (Applause.)

Mr. Shanks—If it will be in order, I would move that we adjourn until half past eight to-morrow morning.

Mr. French—I move as an amendment that we adjourn to the ante-room to look over the exhibits further, and meet again to-morrow morning at nine o'clock.

The motion as amended was put and carried.

## MORNING SESSION.

At 9 o'clock on Thursday morning, August 20, the President called the Convention to order, and the proceedings were resumed as follows:

President—We will open our meeting this morning by discussing the fourth question. I am requested to bring that question forward at this time, as being the most important question of the three left—"To what extent can the wear of driving-wheel tires be allowed before general economy demands their repair?" You will listen to the report of the committee, which will be read by our Secretary. I would say that if there are any objections to this, of course we will proceed in the regular order, but several members have requested that this be taken up at this time.

Mr. French read the report of the committee. Report to be found on page 13.

President—Now, gentlemen, we would like to hear from you one and all on this point. I suppose I shall have to call on the members. Mr. Bryant is one of our best known mechanics as well as roadmasters, and I would like to have him begin this discussion, I think he can open the ball—Mr. Bryant, of the Old Colony road.

Mr. Bryant—I have not much to say at this time on that report, Mr. President.

President—I think every member here has had more or less trouble from this one thing.

Mr. Shanks—Mr. President, I am interested somewhat in the condition that locomotive wheels are kept in on the road that I am connected with, and although this is the first time the question has ever been brought up, I think, in our roadmasters' meetings, it is one that concerns every trackman. It is a very expensive luxury that our mechanical department enjoy when they allow wheels to run until they become so hollow that there is a flange extending sometimes three-quarters of an inch on the outside of the rail. I would not allow, were I consulted in the matter, over a quarter of an inch under any circumstances, because I do not think it is a safe thing to run a locomotive over our point switches and spring-rail frogs with a greater rut in the wheel than that ; and I should prefer to have the expense of turning the wheels off charged to the road department rather than allow the wheels to be run, as some roads allow them to be run, until there is three-quarters of an inch rut in the wheel.

Mr. Bishop—Mr. President, when I first considered this question, I thought it would be one towards which every roadmaster present would be glad to contribute his experience. It is a subject of a great deal of magnitude, and lots of things that I would like to have had appear in that report I thought perhaps it would not be best to have there. I consulted some of the foremen in the machine shop on the Fitchburg road, who had been there for twenty-one years, as I know for a fact, and also our superintendent of motive power, and they all agreed that it would be better to keep the wheels in proper shape, and not allow them to be more than a quarter of an inch track worn. That is what they would like. But they claim to be short of locomotives, and that they cannot be spared from the road ; consequently, they don't get an opportunity to keep the tires in proper shape. I was quite surprised to learn that so many other parts of the locomotive needed repairing at the same time that the wheels ought to be turned ; consequently, the wheels themselves, when an engine has a thorough over-hauling, is a small part of the whole expense of repairing the locomotive. If we or any other organization could convince the proper railroad officers that it would be better to have more locomotives, covering those taken in the shop, I think it would be money to the stockholders of any corporation; but it is difficult to convince them that it is cheaper to have more rolling stock and keep it in better order. I have found and measured driving wheels that were worn five-eighths of an inch. I don't know as I have ever measured one that went the other eighth, as brother Shanks has, but I have found five-eighths, and I have reported it to the chief engineer of the road several times, and the engines have been forced into the shop, and tires been turned down. There are many reasons why the tires should not exceed a quarter of an inch in wear. I will relate one experience which happened three or four weeks ago. I laid in a mile and three-quarters of this new heavy rail, on a straight line and practically a level grade. There is an engineer who runs an accommodation train that makes pretty quick time, who said to me, "Bishop, I can't make as good time on that new rail as I did on the old, what is the matter?" He said, "The engine won't stay on her feet, keeps slipping, and won't make time on that two miles of straight line." I looked at his tires, and I said, "It is no wonder that you can't." The fact of it was they were track worn badly by running formerly over track gauged four feet eight inches and a half, and we laid the new rail to four feet nine inches, and then the additional width of the ball of the rail, which threw this engine first on one side and then on the other on this extra flange, and she slipped and could not keep her headway and make time on a level grade. Last winter I found an engine off the track, trailing through a spring rail, and I looked at the condition of the drivers, and they were worn nearly five-eighths of an inch. There was no doubt in my mind but that the loose rail had been forced out so that the wheel dropped down on the ties. I don't believe that a wheel in proper shape would have derailed that train. There are a great many other cases and experiences that I have in mind, but I want to hear some other members ventilate this subject.

Mr. Muzzey—I hardly feel qualified to speak much on this subject, but a little experience we have had at the west end may be of interest. I should be inclined to put the limit under a quarter of an inch wear, rather than over, and I shall give a few reasons why. First, as already spoken of, the wear and tear on the frogs and switches, which is an item of large expense, as we all know. Second, the wear on the rail. Whenever the gauge becomes wide on our curves and straight lines as well, it produces an increased wear on the rail. And third—a point which we have had experience with at the west end of the Boston & Albany—in renewal of rail by putting in new rail where the head of the new rail is wider than the old. The standard steel which is now being laid on the Boston & Albany, 95-lb. rail, is, as you know, three inches head, and the 72-lb. is only two and one-quarter inches, so that there is three-quarters of an inch difference. Trouble was experienced the very first time that some of our heavy engines went over the first mile of track that was laid ; in fact, it took a freight train, with the ordinary train of twenty-four cars, about an hour to get over the first mile of the track that we laid, with one of their engines. It was found that the tire was worn something over an eighth of an inch, I think about three-sixteenths. Of course, the driving-wheel hugged closely to the two outside corners of the rail, but even with the use of sand they could not get a good grip on the rail. Then we are constantly increasing the size of the rail, and when new rail is put in the track there is a wear and tear on this new rail and great injury done to it. In fact, we have had great experience in injury to this new rail already laid. Of course, they are turning the tires of the engines now, and that will have a tendency to reduce this wear, and make considerable difference in the results.

President—You are the only Boston & Albany man present now, are you ?

Mr. Muzzey—Yes, sir.

President—I understood from one of the roadmasters on your road that they have adopted a standard, by resolving to turn all engine tires after they are worn one-quarter of an inch—that is so, is it not ?

Mr. Muzzey—Yes, sir.

President—Mr. Collins, we would like to hear from you on this subject, we want to get a full and free expression here.

Mr. Collins—I have had the same trouble that no doubt you all have had, with the double-flanged drivers breaking the frog and cutting down the stock rail at switches. The only objection I can find to the report is the limit of three-eighths ; I wish it might be limited to one-fourth, and if it is not asking too much would like to have it an eighth.

President—We can amend the report.

Mr. Collins—The master mechanics on our road claim that they turn off the wheels as fast as they can get to them. They acknowledge the evil, but bring up the same objection, that they are short of engines, and must run them. It has seemed to me that these frogs that have been carried into the shop for repairs, on account of being broken by the double flanges, should have the expense charged wholly to the rolling stock department, the damage being caused by their neglect in not turning down the driving wheels.

President—I would like to ask Mr. Collins one question : Did you ever converse with Mr. Lauder about the wear which he considers permissible in tires ? Mr. Lauder is your master mechanic, as I understand.

Mr. Collins—I have talked with Mr. Lauder many times about this, and he would never express himself in regard to the limit. He would say, "I don't blame you for complaining, and we will get them in as fast as we can ;" but he would not say what he considered the safe limit.

Mr. F. C. Clark—I would like to ask the last gentleman up if he could give us any estimate as to about how long it would take a road doing the business that his road is doing to save money enough by having its engine tires in proper shape, to buy a new engine, so that they would have a spare one, an extra engine, to keep one going into the shop—that is, as an estimate.

Mr. Collins—I would not be prepared to answer that question, but they would surely save it in wear and tear of the frogs and cutting down of our stock rail, which is the principal trouble next to the split switch.

Mr. Shanks—They would get it all back in six months, wouldn't they?

Mr. Collins—Yes, in less time. I have in one yard four spring rail frogs that have been broken on account of the double flange, and we have been able in two cases to trace the breakage to the engine, and the trouble was that double flange, and so admitted by the master mechanic.

President—As I understand it, you have some 1100 trains on your road in a day. Do you think it would take over a week to buy a new engine with the saving?

Mr. Collins—Mr. Bryant has more trains each day over his road than I do.

President—No, but there are 1100 trains on your road, on the whole system, in one day.

Mr. Collins—We have eighty trains over my division each way, Mr. Bryant has over a hundred.

Mr. F. C. Clark—I would like to hear from Mr. Bryant, Mr. President.

Mr. Collins—Of course, these high numbers are made up by trains running on the branches, and the like of that.

President—I have the number of trains from Mr. Lauder himself, over 1100 regular trains a day; that takes in the whole system.

Mr. Collins—Of course our busiest division is from Boston to Readville, and from Boston to South Braintree.

President—We would like to hear from Mr. Bryant on the subject, we know that he has a great fund of information that he is holding back.

Mr. Bryant—Well, I will tell you. I looked over this worn driver business, as I thought, pretty carefully, and while I know the cost of running them, the wear and tear and bruising up of rails, especially where you add on the ball in width, yet it is quite an expense to take an engine into the shop for the express purpose of turning off the drivers. I must admit that. She has to be taken off the wheels. and it will take nearly a week, ordinarily—perhaps some shops less, perhaps some shops more—to get those drivers back, and your rods put up, and everything all in so that she is fit to go back on a regular train to run. If we do not keep agitating this subject we shall not get anywhere, and yet if we put in the knife too keep I am afraid they will kind of turn up their noses, if I may use that term. I think with brother Bishop, that while I myself was satisfied that a quarter of an inch should be the limit, I said, we will call it three-eighths. And it seems to me now, looking the whole field over, that I should be satisfied if they would not pass the limit of three-eighths.

Mr. Collins—There is one thing that is helping us in this matter, which is coming in use—the driver brake. That driver brake is helping to turn the wheels keeping them true to shape. Very recently our driver brake has been applied at the same time that they are to the cars, the same lever does it, which I think is helping much about the wear of the drivers.

Mr. F. C. Clark—Mr. President, I do not get up to make any general remarks at the present time, but in response to what brother Collins has just said. It matters not to us as roadmasters what measures are adopted for keeping those driving wheels in proper condition; it is a question for the superintendent of motive power, in connection with the higher officers of the road, to consider which will give them the best results for the least number of dollars. If the use of this brake here spoken of will maintain the tires in proper condition at a less expense than is required to keep $8,000 idle, and send it into the shop, by all means it should be adopted. The question that is relative to us here is to consider the importance and necessity of doing something, and placing ourselves on record in regard to the condition of our driving wheels when they pass a certain limit. And I should by all means say, don't go beyond one-quarter of an inch. I well understand, however, the motive that has prompted our committee to say three-eighths of an inch as an extreme limit; yet when we see them get up and express themselves that one-quarter of an inch is amply sufficient, I believe that we had better be consistent with our opinions and with ourselves, and if one-quarter of an inch is sufficient, say one-quarter of an inch, and don't go beyond it. We have in connection with our system a new member, Mr. Kilcourse, of the Danbury & Norwalk Division, who has had a great deal of experience, particularly on that division, and at Wilson's Point, in the large yard there, where we are doing quite a heavy freight business, and he perhaps can enlighten us somewhat as to the effect of engines in and out of yards.

Mr. Kilcourse—I don't think there is anything for me to say on that matter. Certainly the driving wheels on an engine when worn down are very unsafe in regard to frogs and switches. We have had a great deal of trouble with them. Our tires have been worn down pretty well, almost a flange on both sides.

Mr. Hyland—Mr. President, I am of the same opinion as the rest of the members on this worn tire business. It is very expensive, and I have had the same experience as Mr. Bishop, of an engine derailed through a worn tire in the same way. Her tires were worn three-quarters of an inch plump, and they had to pull her off of the main line, and then put her in the yard and kept her switching there for two or three months and knocked all the frogs we had to pieces with her. I should be in favor of nothing more than a quarter of an inch.

Mr. Shanks—Mr. President, I am glad Mr. Hyland has brought out the fact that companies are accustomed to run their engines on the main line as long as they dare to, and then put them in the yard to switch with, because that is about the practice on the New London Northern road, and has been for years.

President—I think that is the general practice. We have brother Lane here, who knows something about tires, we would like to hear from him.

Mr. F. C. Clark—I don't believe that Mr. Lane has forgotten in the short period of time that has elapsed since he was with the New York, New Haven & Hartford road, the effect of such tires upon the track, frogs and switches. Therefore, with his interest in the highest good of this Association, with the interest in the question that he feels still, and in the possibility that he finds that he cannot be contented any where except upon a railroad, I do hope that he will give us the benefit of his experience and opinion.

Mr. Lane—Mr. President, I did not come here to talk, I came here to look in the eye these old brother roadmasters that I have been associated with since this organization first commenced, and to enjoy myself for the day. But as I have been called upon, I can say I have not lost all my interest in railroad affairs ; having started in when I was about seventeen years of age and doing nothing else until past fifty, it would be hard work for me to loose all interest in one year and a half. In listening to the arguments as to the effect of worn engine tires on frogs and switches and rails, it brings up my past experience. Little do the master mechanics, I think, as a general thing, take into consideration when they say, "We can't afford to take off that locomotive, to lose the use of it, and turn the tires"—I say, little do they take into consideration the expense to the railroad company that that locomotive is from day to day. On my own road, on the road or division that I was connected with for ten years past, there were some 700 frogs, in the main line some 300 split switches. We all know that it is not the mere effect of an engine on the frog, or on the stock rail of the switch, at the time perhaps, but when the channel is worn for that defective tire to run even moderately smooth, then every perfect wheel, both of cars and engines, pounds until that frog or switch is removed. So that it is not alone the pound of this imperfect tire, but that locomotive places that frog or switch into such a position that every perfect wheel makes a pound until it is removed. I am glad that such a leading road as the B. & A, have taken the subject up, and acknowledged that a tire should not run that is hollowed out over a quarter of an inch. And I think that this Association can take part of the credit of this decision to itself, in the arguments that have come up on this question from year to year. I hope the brethren will continue right on in this line, condemning these practices which have been so expensive in the past, and which many times a roadmaster hardly dared to condemn. I thank you for the invitation to say a word, and shall enjoy hearing the others.

President—Mr. Torr, of the New York, Providence & Boston.

Mr. Torr—Mr. President, we are situated in very much the same way that all of you are, on our road. I don't know what we are going to do to remedy matters. We have something like 200 frogs and switches on the main line and yards, in my division, and I think that nearly every one, if not every frog and stock rail of our split switches, is marked and worn by bad wheels.

President—I would like to ask one question of Mr. Torr: Does the limit of one-quarter of an inch strike you as being the extreme ; you would not advise going beyond that ? That is the point we would like to bring out in this discussion, the opinion of each member as to the extreme limit. One-quarter of an inch, I believe, is the general expression so far, and I would like to have each member speak on that one subject in their remarks, to bring that point out forcibly.

Mr. Torr—I think one-quarter of an inch should be the limit.

President—Mr. Greer, we would like to hear from you.

Mr. Greer—I am with you on this tire question from beginning to end. It is but recently that we settled down to the spring rail frogs or switches. Many roads have used and spoken approvingly of them, and got along nicely, and now they are wearing out. And what are they wearing out with ? Badly worn tires on locomotives. I myself have seen three-quarters of an inch, measured it by my rule ; and I didn't want to believe myself that it could possibly be three-quarters of an inch, but it was a fact. And I agree with all who have spoken that we should not go beyond one-quarter of an inch. There is no way that we can estimate the damage, really, that is done by a tire that has two flanges in crossing frogs or switches.

President—We would like to hear from Mr. Garrison.

Mr. Garrison—I have known three-quarters of an inch, and am in favor of making the limit one-quarter of an inch.

President—Mr. Stevens.

Mr. Stevens—I don't know that I can say much upon this subject. It is pretty evident that roads are running their wheels too long, our frogs and switches show it. But don't we have too many poor wheels on our cars as well as locomotives? The drift of the argument here is all against locomotives, I don't hear any one say anything against bad car wheels. It is no uncommon thing for me to see a freight train going along with a bad wheel, pound and pound and pound, and you can hear it half a mile. It seems to me that a car wheel is often worn too much, as well as the driving wheels of the locomotive. Now, if we can say just one word here to-day, to convince master mechanics that they are running too many poor wheels, we shall have accomplished one good thing. But I don't know but they will turn upon us, and say, "What do the roadmasters know about wheels? We will take care of our business, and they can take care of theirs." I think a good many of them will make that remark. But I think we ought to have our say, and I should consider a quarter of an inch on drivers should be the limit.

Mr. F. C. Clark—Mr. President, the question, as presented to the convention, only covers the driving wheels of our engines; therefore in confining ourselves to the question, we would not reach out after the poor wheels under the cars. Yet it is a question that should come up, and evidently will. We are taking it step by step, and in the reference that was made by my friend Stevens, concerning the position of our master mechanics, I believe that it is generally conceded, particularly in New England, that the opinions of this body of men that meet here, go further with our railroad managers than do the opinions of the master mechanics. I may be a little selfish in this, but I will give you my reason. I have had a little experience in this line. It is but a few months since that I noticed as I went from point to point over our system, that our frogs and switches were showing a great amount of wear, the effect of a great deal of concussion and pounding. I began to look about for the cause, and as I came to a station where a train was stopping, I simply put my rule upon the tire of the driving wheel. I made a note of the date, the number of the engine. and the depth to which the rut was worn in the tire. And as we have three divisions in our system, of course they have superintendents, and I feel almost sometimes as though it was a sort of a grab-bag affair, each one wants to get his work done first, each one wants to be ahead of the other. I don't blame them for making the effort. I went into the superintendent's office, and I asked him if he was aware of the condition of our engines, and the effect they were having upon the frogs and switches. He said, "Yes, I know we have got a number not fit to run." Those were the words he used. He said, "I have been trying to get them in. One of those engines I have been trying for one year to get into the shop." I said, "Have you any objection to my presenting that matter, as not coming through you, directly to the higher authorities?" He said, "No. If you can do anything to get those engines into the shop I will thank you for it." I wrote a letter, which is in my copybook. I wish I had it here, because I can only write or speak when the inspiration is on. We get inspiration from any source we please, and upon any subject that you please, I don't care whether it is railroading or something else. I see a number of ideas contained in that report that are found in the letter which I sent to the general manager—that everywhere I found that our frogs and switches would not last more than half the time. There is a similarity. And yet brother Bishop has not copied from my letter, because he never saw it, and I have not copied from him, because I never saw the report before I came here. And yet you may say we were like-minded, and not only brother Bishop, but the other members of the committee, with the exception of the one point that I mentioned, that part as to the three-eighths of an inch. I told him that we should have to renew our frogs and switches. I enumerated them, told him what their cost would be; that the cost of putting those engines into the shop would be quite a sum, but the cost of relaying all our frogs and switches would be a still larger sum. Among the engines upon our road I found—and I didn't go over on the Housatonic Division, either, to find them, with one exception—I found eleven that were not fit to run. Five of those have been in, the tires turned off, and are out on the road again. Another one is nearly ready, and one more is ready to go in. The master mechanic was ordered peremptorily to take in those engines, and he was given the numbers of them. That is why I ask you gentlemen who are here today, and why the question is presented for discussion, that we here unite ourselves in a demand upon our managers, for the public demands it, safety demands it, economy demands it, and you cannot present a single point that does not demand that the closest attention be paid to this matter. We will go further later on, and take up the question suggested by my friend Stevens, that of car wheels. When we get to this question to vote upon it, I want to reduce the limit so that we shall stand as one man here, and when the presidents and general managers and superintendents of our roads read this report over from time to time, they will know what the effect is. If there was nothing else beyond the point of safety, it is demanded, and will pay. Another point that was presented by Mr. Bishop, in his remarks, the declaration of that engineer that he could not make time on that two miles of track, simply because the head of the rail, I suppose, was a little wider, and those driver flanges rubbing on that rail created a great friction, consequently it was more expensive to run trains with the use of just as much and perhaps more coal, the expense was increased, it was at a loss of time, a loss in every way, a detriment. Therefore, we want to consider this question in all its bearings. Economy and safety are the two principal ones. And as I have expressed all I wish to say, I hope that others who have any criticisms concerning the remarks that I make, will present them here, so that we may get down to the primal cause of all this trouble, and get the facts so established, and the records so made, that they will know that we stand as one man in favor of that which shall be of incalculable good, not only to us as roadmasters, saving us time, but to the treasury of our respective roads. We have with us this morning, Mr. President, one gentleman who, I believe, is not engaged in the sale of engines, therefore, I would like to hear from my friend Ellis.

Mr. Ellis—I think you had better excuse "friend Ellis."

President—We would like to hear from Mr. Stickney of the Boston & Maine.

Mr. Stickney—Mr. President, I think in the consideration of that subject, or, in fact, in discussing any subject connected with the running of our roads, the head of each department seems to look largely, if not entirely, to the expense of his own department, not taking into consideration the amount of damage he may be doing to other departments. I think the motive power department, especially, do not take into consideration, in not taking their engines into the shop, the amount of damage that they do to the road department. But, as Mr. Bishop has made the remark, that they do not feel that they can stand the expense of taking in the engines for the purpose of turning off the tires simply, the question comes up whether there are not appliances which can be attached to the engine, whereby the tires can be kept in such a condition that they will not need turning until such time as general repairs to the engine necessitate taking it into the shop. I take it as generally conceded that there are certain appliances, driver brake shoes, that can be applied to the drivers, and those driver brake shoes can be and should be applied to every engine. That will reduce the hollow tire question to a very small compass. The road that I am connected with does not favor driver brakes to any large extent, that is, the motive power department does not; they have a few, but not many. But as I read in the reports of master mechanics' meetings and other reports in the railroad papers, there are brakes used, and on the market at the present time, that are claimed, and justly, I think, to reduce the locomotive tire question to a very small one. I think we should agitate the fact that if the master mechanics do not want to take in engines for the sake of turning the tires simply, when the other parts of the engine do not demand repairing, they should be required to place these appliances on the engines, both for safety and economy.

President—There is one point, I think, that we lose sight of in this discussion. I suppose almost any master mechanic will admit that it is economy in their own department to keep the tires turned, for when the engine is pounding our frogs to pieces, it is certainly doing as much damage to itself and everything connected with its running gear. We would like to hear from Mr. Nevins, of the Maine Central.

Mr. Nevins—Mr. Clark has expressed my views about the matter, and I believe in fighting it out on that line. I have nothing more to say.

Mr. Bishop—Mr. President, if you will allow me to speak once more upon the subject—

President—Mr. Bishop, we should be glad to hear from you at any time.

Mr. Bishop—Brother Stickney brought out a point that I consider well taken. It is a well known fact that railroad corporations seem to be divided up into several subdepartments, and the roadmaster would like to run his department cheaply, the master mechanic would do the same thing, and the motive power, and all other departments. You will notice that in that report we refer to the proper railroad officials. Now, as we cannot accomplish anything by talking this thing over among ourselves and the different heads of departments, we have got to place this subject before the proper railroad officials, the higher officials, that run the finances of the road, and we have got to convince them that it would be economy to keep the track, rolling stock and power in first-class condition, as a matter of economy. I was glad that Mr. Stickney alluded to that point. If we accomplish anything, it will be through these reports to the presidents of the roads, and superintendents, in some cases, and be able to convince them that what we say are the facts.

President—We have not heard anything from Mr. Drew, of the Old Colony road, I believe, this morning.

Mr. Drew—Mr. President, my experience is similar to that of all the other brothers who have spoken. My limit would be a quarter of an inch or less. The question in my mind is, how this thing is going to be brought about, so as to have it enforced. The master mechanic will say they have not got spare engines, or give some other excuse. If you could convince the general managers or the presidents of the roads that they could save lots of money by it, they might adopt that measure to add to the finauces of the roads. But I should say a quarter of an inch was the extreme limit, and, in fact, if I had it my way, I would have it one-sixteenth.

President—Mr. Post, of the New York, New Haven and Hartford.

Mr. Post—Mr. President, I think the question has been fully discussed, and it is one that is very important to us all. Certainly it is for the traveling public, for they have got to ride over all these tracks and switches. I have taken upon myself lately, wherever I found an engine hollowed out or guttered more than a quarter of an inch, to report it. Our superintendent is a railroad man, and agrees with me that they should be turned down, and we should have them reported for the safety of the traveling public and the benefit of the road.

President—Do I understand that your superintendent, Mr. Davidson, agrees with you that one-quarter of an inch should be the limit?

Mr. Post—He don't give any limit at all. It is of the utmost importance that these engines should be turned down properly and taken care of. They destroy our frogs and switches and make a large expense. In the Bell Dock Yards, where we have quite a number of double split switches, I notice our switches have been hollowing out and destroying the inside rail, that is, where there are double points, grinding it down in bad shape, and spoiling it through the hollow tires.

Mr. F. C. Clark--On that point I would offer the following resolution : Resolved, that it is the sense of this convention that the best economy and the highest degree of safety demand that three-sixteenths of an inch rut worn in the tire is the extreme permissible limit that should be allowed.

Mr. Shanks—Mr. President, I don't quite like to put that thing in that shape, I should like to have it show just what has been said here. I think that the limit has been expressed pretty freely not to exceed a quarter of an inch, and I should put it just as the convention has talked it ; not because I think three-sixteenths is too little, because I would rather have it less than that, but because we have discussed this matter, and we want to have it embody our ideas just as we have expressed them.

President—Have the gentlemen anything to say about the resolution as read by Mr. Clark ? Our Secretary, Mr. French, has not said anything, I believe, on this subject.

Mr. French—I can simply say, Mr. President, that I would like to have one-quarter of an inch made the maximum. We had this question brought before the meeting because we knew we had so much trouble in having the locomotives put into the shops when we felt that they ought to go there. And knowing that our ideas, given as a body, would have weight with the higher officers of the companies, we brought it before the convention at this time, so that it might come under the eyes of those officials, and help us to get rid of the trouble we have experienced with these tires worn down from one-half to three-quarters of an inch.

Mr. Bishop—Mr. Vice-President, I think that we ought to hear from our President on this subject. About a year ago, when invited to the New England Railroad Club, he came down with samples of rails, and presented them to the master mechanics, and we would all like to hear from him.

President—I have nothing to add to what has already been said in this matter. I certainly would not allow them to exceed one-fourth of an inch. I have had more trouble from worn drivers than from any other one thing since I have been on a railroad ; more jealousy caused by reporting them, and I certainly should not wish to have them go over one-quarter of an inch. There is one point that has not been brought out here : I have seen drivers worn so that the flanges were deep enough to take the bolts off of the first rod in a split switch. That is a point we have not touched upon at all. I have seen drivers worn so that the flange is deep enough to cut the bolts off of the first rod of a split switch, so that the wheels cut the fish plate nuts off, and I think Mr. Hyland has seen the same thing, not on his division, but in other places. As Mr. Shanks says, I think that one-quarter of an inch limit would cover the whole ground.

Mr. Hyland—I have known an engine put into service and run until it would cut the bolts—this was not recently, but the way they used to do—and when she got so that she slipped so going up grade that they could not pull any cars with her, they would take her into the yard, and switch with her until she tore the frogs and switches all to pieces, and the engineer complained she rode so hard that she gave him Bright's disease before they took her off.

Mr. Clark—We have still in use, which is very soon going into the shop, an engine that has tires worn one-half an inch, and a little more. She rides very hard, and the engineer said to me but a few days ago, "If they are not going to take that engine into the shop pretty soon, I want them to furnish me with an extra cushion." I thought that illustrated the point very well. I will now offer the following resolution, as a substitute for the one previously offered, which is in two parts: Resolved, that it is the sense of this convention that the best economy and the highest degree of safety demands that one-fourth of an inch rut worn in the tires of engine driving wheels is the extreme permissible limit that should be allowed. Second, Resolved, that we believe it advisable to recommend that an engine receive attention when the rut has reached a depth of three-sixteenths of an inch.

On motion of Mr. Shanks, duly seconded, the resolution was adopted.

### FENCES, CATTLE-GUARDS AND RAILROAD CROSSINGS.

President—If there is nothing more to be said upon this subject, we will take up the next question, "Fences, cattle-guards and railroad crossings." Our Secretary will read the report of the committee.

At the request of the President, the Vice-President, Mr. F. C. Clark, takes the chair.

President pro tem—Now, we don't want a Quaker meeting here, members. I hope some member will set the ball rolling, by giving us his ideas concerning the recommendations of the committee on railroad crossings, cattle-guards, fences, etc. Mr. Hyland, haven't you something to offer upon the recommendations of the committee?

Mr. Hyland—Mr. President and gentlemen, I should agree somewhat with the report of the committee on fences, but not in all places. We have on our road some places where they keep sheep, and the barbed wire fence won't stop them, unless you put on seven or eight wires. A barbed wire fence with four wires won't stop sheep at all, they will go right through it. I built a fence with five wires on the farm where we feed lambs when they come down from Canada, to prevent them going across the river. We turned in a thousand, and we had hardly got out of sight before they were across the river, and we had to go and drive them back. We put on three more wires, making eight, and thus succeeded in stopping them, but when you do that it is more expensive than a board fence. Upon the meadows alongside of the Connecticut River, where they feed lambs in the fall, we never could stop them without building a board fence. But in ordinary places a wire fence is much cheaper than a board fence and lasts longer. That is all I have to say on the fence question.

President pro tem—A word in regard to the second clause in the report concerning cattle-guards.

Mr. Hyland—I believe in a surface cattle-guard. We have a few pit guards, and a few of the surface guards. We have less trouble with surface guards than we have with pit guards. In these days we have to put our ties so thick on pit guards that it is no protection at all, the cattle will walk right over on the ties. In the pit guards that we have, we use rails for stringers, and ties on those six or eight inches apart, and it makes a regular bridge, so that cattle coming along the road walk right over it, while with surface guards it is hard to get them over.

President pro tem—Mr. Collins.

Mr. Collins—In regard to fences, our management, and I would say myself, are very much opposed to the wire fence. We don't like it on account of the damage it causes to cattle from rubbing against it. We don't like the looks of it. A roadmaster riding over his road, unless he is looking very carefully, cannot tell whether his fence is broken or not. If a strand was cut out he would not notice it. And take it where people want to pass through, they are disposed to cut the wire, and our fence is down nearly all the time. We are using a tight board fence in places near stations, or where it is thickly settled. Next we are using a strip board fence. Then we are using off in the woods and remote pastures a post and rail, being a cheaper fence, and it seems to answer our purpose. In regard to cattle-guards, I believe in a surface guard every time. The pits are too much a source of danger, especially to a derailed train going through. We are using a V shaped strip of wood, from six to eight feet long, nailed on to our ties. Cattle don't seem disposed to go over that, although they will if they are actually forced to; but going along the highway of their own accord they will not go over that. In regard to crossings, we are using merely a spruce plank sixteen feet long, each ten inches wide, placing five inside of the track and one outside of the track. Having them all uniform makes it much cheaper for us. The section foremen haven't got to stop to hew, but merely take up the old ones and put the new ones back. Where a crossing is used constantly, as near the city, I would recommend a somewhat harder wood than spruce. At the Roxbury crossing two years ago I put in hard pine, and it is there to-day, but will have to be renewed this fall. But where a crossing is not used but little, I wouldn't advise it, on account of liability to split as you repair the track.

President pro tem—What is the relative duration of your hard pine crossing and your spruce?

Mr. Collins—Well, you take a crossing like Roxbury crossing—that is hard pine, and has been in there two years, while spruce probably would not last two months. Take an ordinary crossing, and we should tear a pine plank to pieces, before it rotted out or wore out, in repairing our tracks.

President pro tem—What would be the relative duration, that is, at an ordinary crossing, an ordinary highway, used, we will say, to the extent of 100 or 150 teams a day?

Mr. Collins—I should say two to one.

President pro tem—What is the relative cost?

Mr. Collins—Our spruce plank cost us $14 to $15 a thousand, and the hard pine $25 to $27. We generally use a plank that is half an inch less thickness than the rail, use three and one-half for a four inch rail, or a four inch for a four and one-half inch rail.

Mr. Bishop—Mr. President, I would like to ask Mr. Collins what success he has in maintaining his fence near stations.

Mr. Collins—The board fence near stations?

Mr. Bishop—Yes.

Mr. Collins—Very good, if it is kept painted.

Mr. Bishop—Don't you find occasionally a board knocked off or a place where they can crawl through ?

Mr. Collins—Yes, especially in certain sections, where we have a constant fight with this unruly element. And also the same with all our other fences. I put up a nice strip fence on Saturday, and Monday morning there was a passage way through it.

Mr. Bishop—Mr. President, on this fence question, I may say that I have followed it up pretty closely for a few years past, and I have about come to the conclusion that there have been improvements made on some things, and some old things are best yet. It is impossible to keep a wire fence up and in good repair and safe condition to put cattle in a pasture against. In long stretches of it the public will take a club and break it down, make a hole through it. And this high board fence, they will do the same with that. They will take something and butt the boards off. You can't keep the public from going where they want to. We have got law enough, but we can't stop them, they will go. Now, I think that the cheapest fence for a corporation to erect, is a fence made of posts and boards and cleated ; having the boards eighteen feet long and eight inches wide, commencing with the first board eight inches from the ground and then an eight inch space, and then another board and another space, and then another board. Such a fence as that is good for fifteen years. The public can get over it any time they want to, and the fence will be left there after they have gone, and somebody else can climb over it. If I were erecting a high board fence, I should make some toe-holes for the public, so that they could put their feet in them and get over it. I believe that an old-fashioned three board fence cleated is the cheapest fence for a company to erect ; and as brother Collins says, you can see when you are riding along whether it is all up or not.

Mr. Collins—I should say that in regard to our strip fence, our strips are sixteen feet long and six inches wide. We put them six inches apart, using four strips, with a strip on top, and also a batten over the joints.

Mr. Bishop—I would like to ask Mr. Collins if that fence was not the easiest one to erect ?

Mr. Collins—Yes, sir.

The President returns to the chair.

President—Mr. Bishop has expressed my opinion about that exactly. I have tried the wire fence, and I have become thoroughly disgusted with it, for it is not any fence at all. I have the same fault to find with it that Mr. Bishop has. I like the board fence the best of anything I have ever used, put up as Mr. Bishop describes, only I use a board on top of it, such as Mr. Collins spoke of. I prefer that to any other kind of fence that I have used, and for the same reasons that Mr. Bishop gives.

Mr. Shanks—I have had a little experience with fences, as well as some other things pertaining to the road department. I have tried the old Virginia fence, the rail fence, the wire fence, the board fence, etc. But it strikes me, looking over them all, that the fence we are now introducing on the Central Vermont system is going to prove the best fence that has ever been put up in this section of the country, at least that I have seen or had anything to do with. It is a woven wire fence, with meshes about five inches and a half by about four inches. You can get the width to suit yourself, put your posts about eight feet apart, and putting it up in proper shape I think you have got a fence that will last, and I don't think there is any difficulty about climbing over it. You can climb over it as much as you want to, the wires will hold you, and it will all go back into place if they do get out of place. I don't think there is any difficulty with regard to that kind of fence. In regard to cattle-guards, I prefer the surface guard, just what kind I am not prepared to say. We are using a wooden slat now, and I hope sometime to use something better, for I think there are better devices for that purpose.

Mr. Greer—I would like to have Mr. Shanks tell us how he builds this woven wire fence.

Mr. Shanks—Mr. President, I would say that this woven wire comes all ready to put on, and the only way that I know of to build it is to set the posts and then stretch the wire on the posts. I have seen it on there, and I have had very good success in doing it. It will not only stop cattle, but will stop sheep and hogs, and is perfectly safe, in my judgment.

Mr. F. C. Clark—I would like to ask Mr. Shanks if he has ever carried any of that fence through the winter, through snow drifts ?

Mr. Shanks—In reply to Mr. Clark's question, I would say that the Central Vermont system put into use this kind of fence for that very purpose, because all other wire fences would break with the heavy snows, while this wire fence we have never known to break, and we have probably got as much snow as any of you.

President—I will say, in answer to Mr. Clark's question, that the Grand Trunk road of Canada, and the Intercolonial, I think, also, use this, and the Grank Trunk exclusively, I believe, at the present time, and they have a great deal of snow there.

Mr. Shanks—I will say that I think that is where it originated with our people, from its use on the Grand Trunk.

President—We would like to hear from Mr. Holbrook.

Mr. Holbrook—All the fences we have built for the last season have been of the woven wire which has just been spoken of. We put our posts ten feet apart. When we first commenced to build it we had some trouble making a very good looking fence, inasmuch as the wire would sag between the posts if not stretched tight, but we have gotten over that difficulty, and think it makes a most excellent fence against sheep and hogs, as well as cattle, and they cannot go through it, which is quite an item up our way. Around stations it makes a very good looking fence, although we generally build a board fence around depots.

President—In what manner did you get over this difficulty?

Mr. Holbrook—By stretching the top and bottom wires as tightly as we could, and then pulling the meshes back towards where we started from, pulling it back some two or three feet, and in that way you get extra breadth in the middle half way between your posts, so that your top wire and bottom wire are perfectly straight and tight, and the meshes are also tight.

Mr. Collins—I would like to ask about what this woven wire fence costs per rod to build.

Mr. Shanks—I think it costs for the wire about forty or forty-five cents, I couldn't say which. Then of course there is the setting of the posts. We set our posts eight feet apart and you know what they cost, about ten cents apiece and the labor.

President—I will say that I am informed that it costs from thirty-seven to fifty cents for the four foot fence per rod, according to the size of the mesh. We would like to hear from Mr. Smith, of the Boston & Maine, Northern Division.

Mr. Smith—We have had a wire fence for the last three years. We have built it just as it happened to be, a one, two, three or four wire fence, and where there are sheep we put up five wires.

President—Mr. Jackman, will you say something about fences?

Mr. Jackman—I don't know as I can give you much information upon the subject of fences. We have had the barbed wire fence, with three to five wires. When we first commenced to build it, we had trouble with its breaking down in the winter, and I thought the cause of that was straining the wires too hard when we put it up, and not allowing for contraction in cold weather. I don't believe in a wire fence. I think it is a cruel and wicked fence, especially for horses, and is bad for cattle. If a horse gets on it nine times out of ten it will spoil him. There is not much doubt but that a barbed wire fence is the cheapest fence that can be built. I can't say anything about the woven wire fence. I should be in favor of the old-fashioned board fence in preference to the wire fence, and it gives better satisfaction to the land owners.

President—Mr. Osgood we should like to hear from.

Mr. Osgood—We have some barbed wire fences and some board fences. We have board fences built thirteen years ago, which probably have not cost five dollars for repairs. Our wire fences have to be gone over every spring and have more or less work on them.

President—You are in favor of a board fence ?

Mr. Osgood—Yes, for economy. I should favor a stone wall, if we could build it. I will say, further, that we have probably nearly a mile of stone wall that does not cost anything for repairs ; what it cost to build it I can't say.

President—Mr. Sibley, can you add something to the general fund ?

Mr. Sibley—We have about thirty miles, I think, of wire fence at present. About half of it is barbed wire. We find that it has done very good service, no cattle getting out where it is properly put up, and our section men can see from their hand car whether the wires are down or not. We also have men go over the section twice a month to repair all fences, whether board or wire. Of this woven wire fence that has been spoken, we have about half a mile, that was sent on trial, the first, I think, we have put up on our system of roads. It has given very good satisfaction, except that people will go over it, as they do with other fences, and in going over it they step in the meshes and break them down. They don't always go very near the posts, but where it is most convenient, I suppose. I like the wire fence, rather than the board fence. I think it will outlast it, and it is much more economical in putting it up, much more cheaply put up than a board fence. We are at present putting up a three-strand braided wire fence, costing about twenty cents a rod for the wire, where I think boards would cost something like forty or forty-five cents, a four-board fence, and we can set our posts a little wider apart, making it cost lesss for posts. With this braided wire, there is more room for expansion and contraction, making a better wire for cold weather. It is a new wire, and we have not had it very thoroughly tested as yet to see how it will stand cold weather. In braiding it is braided loosely, and makes a very sightly fence when erected, and a fence that a community like.

President—We would like to hear from Mr. Hathaway, of the Connecticut River road.

Mr. Hathaway—Mr. President, I have not had experience enough to say much. We have been using the fence made in Palmer, the picket wire fence ; and the great difficulty with putting that up, I think, is on slopes where one post would be perhaps three feet higher than another, and it is hard work to make it straight, to keep the pickets vertical.

President—If there are any others who have not spoken on this subject, we should be glad to hear from them. In regard to cattle-guards, Mr. Hathaway, I suppose you are using a surface guard ?

Mr. Hathaway—Yes ; we have some of the pits in now, but are putting in a surface guard.

Mr. Holbrook—I would like to ask what kind of a guard this surface guard makes in the winter. I went up over some of those northern roads last winter, and I didn't see any cattle-guards or surface guards, rather.

President—In reply to that, it would make about the same as a pit guard filled up with snow.

Mr. Holbrook—We keep the pit guards dug out.

President—I would like to ask Mr. Sibley on which side of the post he puts his wire.

Mr. Sibley—We had some little argument as to which side of the post to put our wire on. We are putting our wire on the railroad track side, where we are fencing against cattle. It makes a difference whether cattle are pastured in a clover field or a thistle lot ; if they put their heads through the fence they will pull the wires off in trying to get their heads back, if the wire is on the same side that they are. In fencing against sheep, I don't think it makes any difference which side they are on, if it is securely fastened to the posts. We have to put up five or six wires in fencing against sheep. It was argued that cattle would rub against the wires and crowd them off, perhaps, if they were put on the railroad side, but I don't remember having seen any creatures rub against barbed wire for scratching purposes. I have seen them pull the wires off when their heads were on the other side.

Mr. F. C. Clark—Mr. President, in order to make sight of the latent energy that exists in this body, I have some more resolutions to offer, because there is the right kind of material here if you can only get it worked into proper shape, give it direction and set it moving. In regard to fences, I would offer, as a substitute for the report of the committee, the following resolution: First—Resolved, that we recommend a board fence, as better and cheaper to maintain than the single wire fence. (By single wire I don't mean that it is absolutely necessary to be one wire, but where there are three wires braided together in one strand we would consider it a single wire fence.) Second—Resolved, that we recommend a careful trial of the woven wire fence, to ascertain its merits.

President—Gentlemen, you have heard the resolution offered by Mr. Clark, does anybody second it?

Mr. Collins—By board fence does he mean a tight board fence or a strip?

Mr. F. C. Clark—Either.

Mr. Collins—There is quite a difference between the two.

Mr. F. C. Clark—That would have to be left to the discretion of the roadmasters, as different localities would require different fences. As our committee reported different styles of board fence in their report, I cover the whole ground with any style of board fence to be used which is the most economical.

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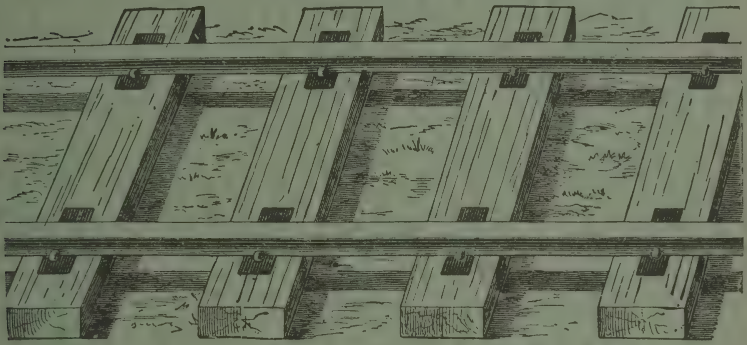

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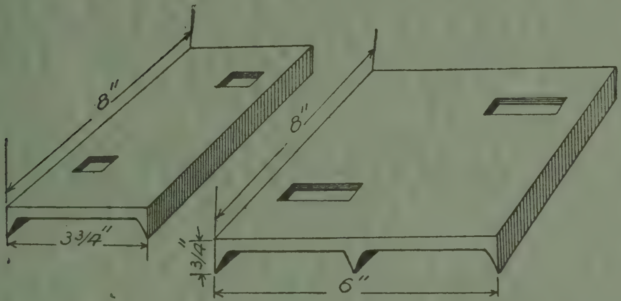

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(Over.)

Mr. Shanks—Isn't it a fact that this Association is already upon record as being in favor of a wire fence?

Mr. F. C. Clark—Mr. President, it is. It has been said that a man has a right to change his mind once a quarter, which is four times a minute.

Mr. Sibley—I would ask Mr. Clark what test he would make of woven wire fence, how severe a test he would make?

Mr. F. C. Clark—A simple test of use was my idea, that we endeavor, so far as we can, to persuade our managers to give us enough to put up so that we can thoroughly understand what it will do, how it will stand winter, snows, and everything of that kind. I will say right here that I have been using a barbed straight wire fence, with a few exceptions where I have been building a board fence. We build ours a little differently, have what we call a fence strip, two by four, spiked on top of our posts. And I have in the past year built a little over a mile, using a board placed edgeways on the posts, in place of the strip, giving us greater vertical strength, to resist the pressure of snow drifts. Our wire fence I have frequently found, in a great many sections, where we have had driven snows, down in the spring of the year, under water, and broken. But I am offering this resolution in a form calculated to set you to thinking and arouse all the opposition I can to the resolution and to myself as the author of it. I will be prepared to meet you.

President—The resolutions are now before the house—what disposition shall be made of them?

Mr. F. C. Clark—Mr. President—I will read the first resolution: Resolved, that we recommend a board fence, as better and cheaper to maintain than the single wire fence. And in order that my friend Sibley may get the phraseology, and not miss a word of it, I will read the second clause: Resolved, that we recommend a careful trial of the woven wire fence, to ascertain its merits.

On motion of Mr. Shanks, duly seconded, the resolutions were adopted.

Mr. F. C. Clark—Mr. President, I would move you still further that for the committee's report on cattle-guards be substituted the following: First—Resolved, that we regard the pit cattle-guard as requiring to be superseded by some other form of cattle-guard. Second—Resolved, that we recommend a trial of the Common Sense Tile Guard, which is shown here, and a report upon its merits be made at a future meeting, and also a trial of all forms of surface guards.

On motion of Mr. Shanks, duly seconded, the resolutions were adopted.

On motion of Mr. F. C. Clark, duly seconded, the report of the committee concerning highway crossings was adopted.

R. D. Kellogg—Gentlemen, I am not a member of your organization, but have come nearly 1500 miles on the invitation of your Secretary, for the purpose of saying a word to this Association upon the subject which you have just passed upon. If not out of order, I should like to say a few words, if out of order you will please excuse me.

Mr. F. C. Clark—Mr. President, allow me just one word. With all courtesy and respect to our visiting friend, who has desired to present his matter, we shall give him and all an opportunity of expressing themselves in the anteroom, when we adjourn there, not only to look them in the face, but to examine the inventions and improvements which they present.

## BEST METHOD OF SECURING RAILS, HOLDING GAUGE ON CURVES, SPIKES, BRACES, PLATES, ETC.

President—The next question will be, "Best method of securing rails to ties outside of joints, holding gauge on curves, spikes, braces, plates, etc." Messrs. Hyland, Stevens and Collins, committee. Will you read the report of the committee, Mr. Secretary?

Mr. French read the report of the committee (to be found on page 13).

The President temporarily retires, and the Vice-President takes the chair.

President pro tem—Gentlemen, the question is open for discussion. We are going to adjourn for dinner before a very great while, but it will not be for some little time yet. I want to say to the members that as you exchange your friendly greetings, don't forget to remember your obligations to the Association, and give us your attention all that is possible. We want to do hard work here, if we have not before this year. This report covers a great deal of ground, and there are some points in it, too, that I think we will find a little difference of opinion upon, fine as it is. Now, I would like to hear from Mr. Holbrook, of the New York, New Haven & Hartford road.

Mr. Holbrook—On our road we have had little or no experience with these different kinds of patent spikes. While they may be very good, and I have no doubt that they are, before committing myself to them, or before the convention commits itself to any one particular kind of spike, I think that perhaps it would be well for us to give them a trial, in the same way in which we, on the recommendation of the Association, tried the tie plate last year. Some of us since then have had some little experience with tie plates. I think the first question after a roadmaster gets his order filled for the tie plate is how should they be put on. I know that our foremen tried a good many different ways, and we finally have gotten a scheme whereby on new track we have little or no trouble. A gang of twelve men will put on half a mile of them in a day. The spiking after the plates are once on is done at no greater cost than without the plate. We mark the line side of the ties, and put our plates on the line side. The gauge plate, as it might be called, the opposite of the line, we put on with a gauge which is made a proper length, and in that way we have no trouble with new track whatever. On old track we have put on very few, although we have put quite a good many on under our leads and switches. We have quite a large yard, which has been built entirely with them in the last year. As far as braces are concerned, I think that the tie plate will do away with the use of them greatly on curves. I think that that will be a great saving of expense. Of course it will not do away with them entirely, there are places where you must use braces. We have used some 10,000 of these plates this year, and I should like to hear from some other members, how they put them on without bending the plates, under old track, in new ties, oak ties for instance.

President pro tem—We would like to hear from Mr. Stevens.

Mr. Stevens—The report, in my opinion, does not go quite far enough, the committee stating that they hadn't had much experience with tie plates. Although I am one of those that used them, my experience is quite limited, but I think they are a grand thing to keep the track in place. I think they answer the purpose of a rail plate, and I think with the tie plate and the steel spike which we have got, it makes the best and most secure fastening for rails that there is. I have had three or four thousand put on a straight line. In comparing the ties that they are on, with ties that have not them on, I think they will save the ties three years. I don't know as I would put a plate on a hemlock tie, because that don't last long, in fact I wouldn't use a hemlock tie if I could help it; but a cedar tie I think it would prolong the life of three years. Another advantage, it keeps your rails from rolling. I have the plate on curves, as I have no doubt all of you have. If I were to have my own way in regard to it, I should use plates altogether, the tie plates, use them and the steel spike, and don't believe you could make any improvement. I use a few rail braces on some sharp curves, but I think with a tie plate I should not use braces.

President pro tem—How sharp are those curves you mention?

Mr. Stevens—Nineteen.

President pro tem—Do you think on a nineteen degree curve you could hold your rail with a tie plate as well as with a rail brace?

Mr. Stevens—I don't know why not.

President pro tem—You don't know why you could not, but you have not tried them on those curves yet?

Mr. Stevens—No, sir, I have not. I put on braces, but if I had had tie plates when I laid those curves, I should not have put the braces on.

President pro tem—I would ask if there is any member present who has used the Servis tie plate on curves, that is, above a four degree curve?

Mr. Holbrook—We have some few of them on a sixteen degree, and all those places where we had to switch. The ties formerly gave out in eighteen months, cut down an inch and a half or two inches; we turned the ties over, and put on the tie plate, since which time we have had no further trouble with the curves at all. On these curves we had rail braces before.

The President returns to the chair.

President—Is there any member who has used any form of tie plate except the Servis tie plate?

Mr. Nevens—Mr. President, we have had the Servis tie plates on our road six years, and we have half a million now. They are worth all we gave for them. They will save the life of ties, and keep the track in line better and in better running order. As far as cutting the ties is concerned, the tie don't cut nearly so bad with the tie plate as it will without it. At any rate, it will save a renewal of your ties. As far as the canting of the rail is concerned, it don't altogether prevent that, but the track stands a little better in that direction with them than it does without them. They are worth all you give for them to keep your track in gauge. We have half a million on our road, and are still putting them on. We have never used any other plate but the Servis tie plate. I have got some Servis tie plates on an eight degree curve, the first that were sent to us. The ties were two years old when I put them there, and they have not been changed in six years, and we have not had a particle of difficulty with them.

President—What ties do you use ?

Mr. Nevens—Cedar, hemlock and ash.

President—All soft wood ?

Mr. Nevens—Yes. We have got them on an eighteen degree curve, going on to the Augusta bridge ; also around Portland, on the main line.

Mr. Stevens—I understood him to say that the tie plate would not prevent the rail from rolling on the track.

Mr. Nevens—No sir, not entirely.

Mr. Stevens—I have none on a curve, but I had an impression that they were good for that.

Mr. Nevens—Not entirely, but it goes a good ways towards holding it up.

President—I may have misunderstood Mr. Nevens in regard to that curve, but I understood that it was an eighteen degree curve.

Mr. Nevens—Yes, going on Augusta bridge, on the main line.

Mr. Collins—I would like to ask as to the condition of the tie under the plate. There is an objection brought up that it would have a tendency to wreck the tie under the plate.

Mr. Nevens—I should say not, no indication of that now. The tie plates that have been there six years have just begun to cut into the cedar ties.

Mr. Collins—Do your tie plates bend ?

Mr. Nevens—Not as yet.

Mr. Post—I would like to inquire the size of the tie plate ?

Mr. Nevens—They are eight inches by four.

Mr. Muzzey—I would like to inquire of Mr. Nevens, if in spiking, a trackman breaks a spike in a plate, how he gets over that ? If the spike breaks and is left in the hole, how does he drive another spike ?

Mr. Nevens—Takes up the plate and moves it. In shimming track, the tie plate is far superior to anything that I have ever seen.

Mr. Muzzey—Mr. President, I would say that we have not had much experience on the Boston & Albany with them yet, but we are very extensively trying them. The first we put on, I think, about a year ago, we tried them on about half a mile of the fourth division. They stood there, we thought, very well. This year on the fourth division we are laying about fourteen miles of 95-lb. steel, and putting those on every tie, and can only tell after some years' experience, just what service they will do. We have heard the best reports of them, and believe in them so far as we have seen.

President—I would like to ask Mr. Nevens another question in regard to this: Do you renew all your ties at once when you put these on, or do you put them on just as you ordinarily would renew?

Mr. Nevens—No, we do not.

Mr. Holbrook—I would like to ask him if all the tie plates were put in at once, in the first place, or were they put under only as new ties were put in?

Mr. Nevens—Where we are renewing ties along and there are tie plates there, we take them off and put them on as we go along.

Mr. Holbrook—In the first place?

Mr. Nevens—We put them on the ties as they lay in the track, right on the tops.

President—Mr. Hathaway, what has been your experience?

Mr. Hathaway—We put on about 4,000, I think, in May. They were most all of them put on in one place. Every tie had a tie plate put on except at the joint, we don't put any on at the joint. We didn't have as much trouble as we expected in putting them on, and they have held the gauge on the straight line and curves since then, and we think a great deal of them.

President—Mr. Mosher?

Mr. Mosher—I don't think that I have anything new to add. We simply started in on the Servis tie plates this year, and we don't know anything about them.

President—Is there any other gentleman who can say anything in regard to this?

Mr. Post—We bought 3,000 of them last year, and put them in the track on the curves near Mott Haven, and they have given fine satisfaction, we are very much pleased with them. It is very important to us to keep our rail up, it costs a great deal to raise track with stone ballast. I think we can save the price of the plates with one set of ties. Our plates are six by nine inches, big ones, they stand up nicely. We still have 10,000 that we are putting on of the same kind.

President—Gentlemen, if you will give me your attention for one moment I have a few words to say. We would like to take a little intermission from now until twelve o'clock in order that you may look over and have explained to you the railway appliances in the ante-room, and I would request each member to take a circular of each one of the appliances, and meet here promptly at half past one and finish the business in hand. We have some little business to attend to this afternoon, and we would like to meet promptly at half past one.

A recess was then taken until half past one.

## AFTERNOON SESSION.

At half past one the President called the Convention to order.

Mr. F. C. Clark—Mr. President, although but few of our members are present, it becomes absolutely necessary that we proceed with our business, or we are not going to get through by the time that you wish to take your excursion.

President—We will proceed by taking up unfinished and miscellaneous business. The discussion of the third question will be put off until this is taken up, and will be had later.

Mr. F. C. Clark—There are a few things to be taken up that are necessary and essential. The first is the salary of our Secretary. I find from conversation with him, and from observation, that he has been doing so much, and we have been requiring so much more work from him during the past year, in the circulation of our pamphlets, and various other matters, that the salary that is paid him does not begin to cover the expense. I therefore move you that his salary be increased to $75 per year.

The motion was seconded by Mr. Stickney and carried.

Mr. F. C. Clark—Mr. President, the next subject—there is another one that comes in between, but I would like to defer that until there are more of the members present—is the place of our next meeting. I will not make a motion in regard to that, I would like to hear the views of some of those present.

Mr. Stevens—I would like to say a word in regard to the next place of meeting. We have met here now in Boston four years in succession, and I think that there is quite a sentiment in favor of our meeting somewhere else another year—I am in favor of it, surely. It seems to me that there are places that can be reached with equal facility, and as variety is the spice of life, I think we should have a little variety. Now, we have had as good meetings in other places as we ever had in Boston. I would like to go somewhere else, and my choice would be Worcester. That is a central place. I am sorry there are not more members here, but in my judgment that would be more central. I make a motion that our next meeting be held at Worcester.

President—If you will allow this to lie on the table until there are more members here, later on I will call it up ; I would like to have a general expression.

Mr. F. C. Clark—As soon as the other members get in from their dinner, I will second the motion. I have a resolution or two to offer, one of which reads as follows : Resolved, that the thanks of this Convention are due to the supply men, who have done so much to increase the interest of this meeting and in enhancing the pleasant excursion which is to follow. Second—Resolved, that our thanks are due to all railroad managers and superintendents who have kindly given us time to attend this meeting and in furnishing free transportation, particular mention being made of General Manager Kendrick for his courtesy to our reporter and to ourselves.

President—What shall we do with the resolutions as read by our Vice-President ? If there are no objections, we will enter them on the records of the meeting as matter of proceeding and as adopted. I have a committee to appoint on resolutions upon the death of our brother, A. C. Woodworth, of the New England road. I appoint F. C. Clark, C. B. Lentell and G. L. R. French, a committee to draw up resolutions.

Mr. F. C. Clark—Mr. President, I am sorry we did not talk certain matters over here this morning, it seems to be so difficult to get the members together. I am reminded of what Horace Greeley once said when he was asked to deliver an address at an agricultural fair in the town of Brandon, Vermont. It took them a long time to decipher his answer, as the chirography was not of the most legible character, but they Englished it in this wise : "I will be at your meeting. I would like to speak early, as I do not like to talk to the music of departing wheels." We don't like to act or talk to the music of departing footsteps. I would say, for the edification of those who have come in within the last few minutes, that since dinner we have taken up the matter of the salary of our Secretary, and by vote of the members present have increased it to $75 per annum. The next was a motion made by Mr. Stevens, concerning the next place of meeting, and he made a motion that we meet at Worcester, as we had met here a number of times, and he wants to get out of Boston once more. It is a good idea, if we can only get all the rest of the men who can so easily get into Boston to come to Worcester, it will be entirely satisfactory. You must know that the President of the Association takes a little pride in the matter. Each one as he assumes the duties of the presidential chair and the gavel, feels a desire to stand as well as his predecessor, not only in numbers but in interest. Having been elected to the office of President of your Association for the next year, it is my desire to see you all present, no matter where our next meeting is held. I don't want a man to say, "Well, if it had been in Boston I could have been there." You can get away from Boston, I think, to go off as far as Worcester, just as well as some of us can come from the remote sections of New England down to Boston. And I have no fear but that by approaching the managers of the roads leading into Worcester, principally from this section of the country, the B. & A., you can obtain transportation, and get there ; but I want to see your faces there, and I want you to bring your ideas with you, bring your powers of speech with you, and give us the best you have got. Now then I would second the motion of Mr. Stevens, that our next meeting of this Association be held at Worcester.

Mr. Mosher—I would like to propose that we meet at the Cooley House, Springfield. I think the conveniences there are better than you can find in Worcester, and I don't believe it would be much more inconvenient to get there.

President—Do you accept the amendment ?

Mr. Stevens—If it is agreeable to the rest. We have met at Springfield once, and we never have met at Worcester since we were born. We were born at Worcester, and the Association has never been back to the place of its childhood. My preference would be Worcester, but, still, the wish of the majority is agreeable to me.

Mr. Mosher—So far as I know, there are no accommodations at Worcester. The only house you can go to is the Wesley House, if I am not mistaken. The Cooley House is right next door to the station. I suggest that different places be proposed, and we vote on them.

Mr. French—Every year after we get to our place of meeting we hear from different members the expression of the wish that we had met somewhere else. Heretofore at the close of the meeting we have hurriedly decided where we should meet next year. We have not voted on it all. Now, I think, as Mr. Mosher desires, it would be a good thing to vote by ballot on the place where we shall meet, nominate one or two places, and then get the choice of the convention, and carry out the wishes of the majority shown by that vote, so that we will all be satisfied and all plan to come to that place next year, wherever it is.

President—I think our Secretary is right, and if there is any other place that any one in the hall, any member, would wish to meet at, let him make mention of the fact, and we will decide the question by a rising vote.

Mr. Shanks—Mr. President, I would propose Portland, Maine. I want to go to the remotest district, way off here in the east.

President—Has any member any other meeting place to suggest.

A rising vote was then taken, resulting in ten votes for Worcester. nine for Springfield, and two for Portland. The President declared that there had been no choice.

Mr. F. C. Clark—I would like to say one word right here, although I cannot make a motion, not having voted with those who voted in favor of Worcester. If, as stated by my friend from the B. & A. road, we have not the conveniences and cannot secure them at that place, and it is at a distance, it will be so inconvenient that it will detract largely from the interest of our convention, and be inconvenient for our supply men too—we must not forget them, because of the advantage to us of having their inventions present—and I think it would be well to reconsider the vote. It may not be necessary, since our chairman declares that it is no vote, inasmuch as there was not a majority of all, but if he had decided otherwise, it would have been necessary for some gentleman who voted in favor of Worcester to make a motion to reconsider. I think perhaps we are a little unwise, although I would like to meet at Worcester, as proposed by my friend Stevens, but I do think that the suggestion of meeting at the Cooley House in Springfield is a good one, our accommodations will be fine and everything will be convenient, which will be a great advantage to us.

After some further discussion, another rising vote was taken, and the Cooley house at Springfield was declared chosen as the place of next year's meeting.

Mr. F. C. Clark—There is one other matter that I want to call attention to. I think we took a vote, and I supposed that the matter was attended to long ago, that is, the testimonial to our ex-secretary of the Association, which we were to present to him, in the shape of an album containing our photos. It has not been accomplished, and why? Simply because so many of you—and I don't know of any man here who looks bad enough to tear the instrument all in pieces—have not sent in those photos. It is something that has been neglected. Of course, it would be a pleasure to our friend Ellis to open that album and look over the faces of those whom he had been associated with in this convention. I say it is due him, from the fact that during the time that he held the office of secretary of the Association, he devoted his time assiduously to the best interests of the Association. I will go further than that—now that he has ceased to be a member amongst us, his interest has not grown cold, but he has been exerting himself in this direction, and in that direction, to help our Secretary, our President, probably myself, and others, to get us interested in the work and keep us together. So that we have had. as a result, one of the most pleasant and agreeable sessions that I have attended of this Association. Therefore, brothers, I say to you who have not presented those photos for the purpose of giving this testimonial, don't let the grass grow under your feet until you do it.

Mr. Spaulding—I recollect that perfectly well now, but I plead guilty.

Mr. French—Mr. President, I have received about seventeen photos, and a promise from each one of the members that he would send his to me during the year, but with the exception of two or three scattering ones, none have been received. We are taking good care of those already sent, and if those of you who have not sent in their pictures, will do so within the next thirty days, we will get the album around to Mr. Ellis by Christmas sure. Let us promise him that now.

Mr. Drew—Mr. President, I would like to know about the size. I never heard about this matter before.

Mr. French—Of cabinet size. We took up a collection for the album, and I thought that every one knew about the matter.

President—If there is no other unfinished or miscellaneous business, we will proceed to finish up our discussion of the third article.

Mr. F. C. Clark—In order to get the members at work, Mr. President, I have some resolutions here to offer. As the time is short—the busses will be at the door at three o'clock and it is now six minutes past two—we should make the most of it. One brother has said that he expected I was going to tear his report all in pieces, and he was ready to tear the resolutions all in pieces. That is just what I have come here for, it is all right, and I am glad of it. Let us have the best of the wine at the last of the feast and the most of it. The resolutions are as follows: Resolved, that we recommend the use of the Servis tie plate from motives of economy, and for the preservation of the gauge of our track. Second—Resolved, that track should not be spiked wider than standard gauge, except for curves that exceed a ten degree curve. Third—Resolved, that the Goldie spike possesses superior merit to any spike yet presented.

Mr. Collins—I would like to say a word, as one of the committee, as to why we recommended the spike. Last spring I had some severe tests made of the spike, took it to the blacksmith's trip hammer, and tried in all shapes to break the head off, but did not succeed. I had men drive them in the track and try to break that head, but haven't done it yet. And upon counting the spikes in a keg, both iron and steel, I found the steel spikes were much cheaper, spike for spike, than the iron ones. We all know that when men are a little careless in spiking track down, the head comes off, and it is of no use. It happens in our chairs and angle-bars. As one gentleman asked this forenoon, if one breaks off in the Servis tie plate, what would you do? I say let us have a spike which the head won't break off of, and we get it in the soft steel.

Mr. Hyland—Mr. President, I would like to ask brother Clark if he can keep the track at standard gauge, four feet eight and one-half inches, on a six or seven degree curve, with trains running forty and fifty miles an hour, and if he can I would like to know how he does it.

Mr. F. C. Clark—I do it with rail braces.

Mr. Holbrook—I would like to make a statement. There have been several very interesting articles on this subject in the Roadmaster and Foreman, a paper which a good many of us know about, and a paper which a good many of us are a little interested in reading. There was one article in that on this subject—by whom written I forget just at present—which said that the best way to overcome the difficulty of which you have spoken,—that the best way to widen curves was not to do it at all. I think that that man is all right, I think that his statement is true. The master mechanic looks out for that. His gauge of the wheels of the cars is only four feet eight, and there is half an inch play right there. His locomotive drivers are made in the same way. I have seen trains run around a sixteen degree curve as fast as they could go, and the curves have never been widened at all, and we never had any difficulty at all with it. with our eight wheel engines, which are about as hard on the track as any engines I know of.

President—I would like to ask Mr. Holbrook if he has flanges on both pair of drivers.

Mr. Holbrook—There were flanges on both pair of drivers. I don't think that they ought to make any engines with flanges on both pair of drivers; we are afflicted in that way just at present.

The President temporarily retires, and the Vice-President takes the chair.

President pro tem—This gauge matter is one that I am a little mite tender upon. When I first went on the road some fourteen years age, I had a nine degree curve on the main line, and I thought, as brother Holbrook does, that the master mechanic had made the allowance, and that curve should be spiked to gauge. I did so, new ties, everything all right about the curve. I found out in a very short time that it would not stay there. I had it put back and braces put on it, but still it would not stay where I put it. I spiked it right out three-quarters of an inch, and it remains there to-day, never has been changed. The rails do not roll, and remain where they are spiked. That is pretty good evidence that it was at about the place where it belonged. and I have made it a rule ever since on all curves over four degrees to spike them wide. We have some twenty degree curves on the main line, and the only way that I can get an eight-wheeled engine around there successfully is by widening the track. I can do it that way, and don't require a third or fourth rail to do it, they go around on two rails. I certainly should object to the second clause in that report, I don't believe it is right.

Mr. Collins—As long as I was section foreman down at Buzzard's Bay, under Mr. Drew, I had at the beginning of the section a five and one-half degree curve on the main line. The outside rails continually rolled over, as well as the inside ones, and once in a while Mr. Drew would come along, and say, " You make it too wide here." Finally we relaid it, faced the ties, got the rail in good shape, and put it half an inch wide gauge. While I was there, I had nothing more to do with it so far as the gauge was concerned. Of course, we had to renew the ties. Since then I have made it a rule to lay it a sixteenth of an inch wide to each degree. And then I use an extra guard rail, and I find that my wheels are not pressing so hard against the ball of the rail. With me it has been a success to widen in that way.

President pro tem—In making this change, widening gauge, I did it after reading a letter or an address of an engineer that used to be on the Fitchburg road. I think Mr. Spaulding will know him, Thomas Doane, on the west end. He built a road in Missouri, I think, where he first adopted or put that in practice, and it was a quarter of an inch to a degree after four degrees. I think that was his method of widening, a quarter of an inch after you got up to four degrees. I don't think that there is any trouble at all in putting an eight-wheeled locomotive around any curve that you wish to by widening sufficiently, and I think that it is the only way that you can do it.

Mr. Hyland—I can't see the point in brother Clark's statement that to keep his curves in gauge he uses rail braces. Now, I don't see why it is not just as well to spike your track out and leave off the rail braces. The rail braces are an element of expense, and they don't do any good if you spike your track out where it ought to go. I can't keep my curves without spiking them wide. I have had the same experience that brother Collins speaks of, with a five degree curve. I attempted to relay it, and when I got it down it was just as bad as ever. It didn't spread at the bottom, because the spikes held there, but you got a pressure between the heads of your rails and nowhere else, and sprung your rails wider to give your rolling stock a chance to get around it. If you confine the rail you have got so much more pressure on your driving wheels, and you have got so much more friction to overcome. I don't see the argument at all in saying, spike four feet eight inches and a half on sharp curves. You take a sixteen degree curve, and the middle of the wheel base is about the difference between the gauge of the wheel and the gauge of the track.

The President returns and takes the chair.

Mr. F. C. Clark—that is just what I expected. I read in the report, "For holding gauge on curves would recommend that the track be spiked wider than standard gauge, one-sixteenth of an inch for each degree of curvature." There being no starting point mentioned, I suppose you would commence with a one degree curve and spike it one-sixteenth out, that is the way I understand it; and I thought I would go just as far beyond and would make it ten degrees. I will say this, however: I don't begin quite as low as my namesake, but I begin with a five degree curve, and widen all my curves, notwithstanding what I said in that resolution. You would have taken but little interest in this, if I had started it right in the first place, you would not have got up and disputed it. "What use are rail braces at all?" says one. Because we have some heavy grades, and being so located, was one reason why I proposed the worst thing that any roadmaster has to contend with. I have got a great many miles of track that is laid with a rail some of which is four and one-eighth and some of it four and one-quarter in height, and only three and three-quarter inches rail base. To hold that upright on curves, even when spiked wide gauge, I find it necessary for safety to use rail braces. It is for that and no other reason. But I spike my curves a quarter of an inch wide gauge, those that are five up to eight, above that half an inch, and so on as I increase the curvature, until I get up to three-quarters of an inch on the sharpest curves. That we have used in our main line, with one exception ; we have one that is twenty, and that is spiked seven-eighths of an inch wide. It was absolutely necessary to spike it one-half inch out, as you could see by watching the rails as one of our light engines went around ; you would at once see the necessity of widening the gauge, as I did, after reaching a certain point.

Mr. Shanks—Mr. President, the question before us is an interesting one, and one that I think will bear considerable discussion. I don't think there is any need of widening gauge on a curve until you reach five degrees, at least ; over that I do advise widening. I laid a seventeen degree curve about three weeks ago, and widened the gauge just nine-sixteenths, and it worked just as nice as a pin, does to-day, works well. And it is sufficient, I don't think there is any need of making improvement. Following the suggestion of the report, on that curve I should have got an inch and an eighth.

Mr. Hyland—No, I beg your pardon, the report says not to exceed an inch.

Mr. Shanks—Excuse me, I didn't notice that. I think that we seldom reach a curvature that it is necessary to go over three-quarters of an inch. There are cases where we have engines that are wide gauge, as we have on the New London Northern, where they are seven-eighths of an inch wide gauge. There it would necessitate widening out. I use braces on our curves, because I think it holds the rail right side up, where you have got as many sharp curves as we have on our line, it is a great benefit and support. It saves the spikes, and makes our tracks stronger. Where we are running around a nine or ten degree curve with a heavy locomotive, I think it is necessary to brace it.

Mr. Bishop—Mr. Shanks speaks of how nice they went around with the gauge that he adopted—I would like to ask him if he thinks they would not have gone around with four feet eight and a half.

Mr. Shanks—I think they would have, but they would have turned those rails over in a little while.

Mr. Holbrook—I hardly think they would have turned them over.

Mr. Stevens—I would like to ask if this resolution in regard to widening would apply to those who have already widened their gauge to nine inches instead of eight and a half, those who have adopted nine inches.

President—This, I understand, applies to the four feet eight and a half gauge.

Mr. Stevens—Does it refer to the widened gauge or the old four feet eight and a half ?

Mr. F. C. Clark—The resolution reads as follows : Resolved, that track should not be spiked wider than standard gauge, except for curves that exceed ten degrees.

Mr. Collins—The Fitchburg road have adopted the four feet nine gauge, I think, and other roads have adopted it.

Mr. Bishop—Mr. President—it is a fact that the Fitchburg two years ago, I think, did adopt the four feet nine gauge, and as far as I am concerned, I consider it the biggest nuisance we have had to contend with, and other roadmasters have freely expressed their opinion about it. You will find that track just as wide in the spring as it was when it was four feet eight and a half. I begin to believe the more room you give them to thrash around in, the more they will thrash.

Mr. Shanks—I would like to know from Mr. Bishop if he can tell us just why they made that change.

Mr. Bishop—It was changed because we connected with the Pennsylvania railroad. Their gauge was four feet nine, and their cars went hard through our track ; but I have watched their cars standing still and passing through, and I never saw a Pennsylvania car that would fill the four feet eight and a half gauge within a half or three-quarters of an inch, and then when you put them out that half inch you have got from an inch to an inch and a quarter play room.

Mr. Holbrook—The Pennsylvania car will go over our road all right.

Mr. Shanks—I want to just state that the Pennsylvania cars pass over our road, not so many, perhaps, as on those through lines from east to west. But we never have had any difficulty on our four feet eight and a half gauge with Pennsylvania cars. I would simply make this statement that the reason why I should widen my gauge on curves is on account of the locomotives, not on account of the cars at all, but on account of the locomotives.

President—Mr. Spaulding, have you any information ?

Mr. Spaulding—I haven't much to say, Mr. President. As Mr. Bishop says, we have had instructions to put our new work at four feet nine gauge ; and I have understood that the new engines were set to that gauge, and the engines that have been repaired, the cars, and so on, are put at that gauge, that is the way I understand it. I think it is too wide for the old engines and cars, and it don't work so well. In many places we have the advantage of these brothers who speak about widening, we don't have to widen. All new track I have laid, and all curves I have laid in about two years, have been laid to that gauge, and we have had no particular difficulty in getting through. No accidents have occurred from the change of gauge as far as I know.

Mr. Post—We have at Springfield on the main line a twelve-thirty curve, and I had it spiked to gauge four feet eight and a half, and all our passenger trains go through it every day. We have there a transfer track, a twenty degree curve, a short track, only a short portion at that degree, which is all spiked to gauge four feet eight and a half. All the travel to the Boston & Albany road on that division goes through that track. We have no trouble, the rails lie in good line, and we have never had a derailment on it.

President—I would ask Mr. Post if he has more than two rails on those curves.

Mr. Post—We have a guard rail, yes.

President—By widening, as I understand it, you do away with that extra rail, and don't have to use it at all.

Mr. Holbrook—I think we have all of us seen a locomotive with the front drivers on the ground, the rear drivers on the rail, and the pony truck on the rail, and that shows that there is a little bit of swing in the locomotive.

Mr. Hyland—I will say that I have seen locomotives in that way. I have seen them drop off on the ground with the middle wheels.

Mr. F. C. Clark—I will add, Mr. President, that to accommodate the gentlemen, and accord with my own opinion, I have changed the second resolution, by making it read five instead of ten degree curve. And I want to say just here—I won't take up any time—that I presume there is a good deal of difference of opinion that comes to us from the difference in our locomotives, more, perhaps, than from any one thing. Certain locomotives are built with a slight variation. Take a very long wheel base, take a locomotive that has ten and a half feet rail base, and you can't measure the deflection from a straight line in the ten and a half feet, and you will find that you are crowding things pretty closely. The first resolution is that we recommend the use of the Servis tie plate, from motives of economy and for the preservation of the gauge of our track.

The resolution was then put and carried.

Mr. F. C. Clark—The second resolution reads as follows: Resolved, that track should not be spiked wider than standard gauge, except on curves that exceed a five degree curve.

The resolution was put and carried.

Mr. F. C. Clark—The third resolution is as follows: Resolved, that the Goldie spike possesses superior merit, and we advise a continued test of them.

The resolution was put and carried.

Mr. Collins—Years ago I had considerable trouble in different places about ties skewing, and I accidentally read an article, where, I think, Parsons claimed that if the spikes on the inside of the track were put on the same side of the tie they would remain square with the rail. I have adopted that for the rule of my foremen, that all the spikes inside shall be on the same edge of the tie, and the tie remains square, and it also helps to preserve my gauge.

President—That is the general practice, I think, that is the way we spike. If there are no objections we will now proceed to close. If any of the members think of anything else they wish to bring up, they will now have an opportunity.

Mr. F. C. Clark—I want to say just one word, I made the remarks previously when some of you were not here. Our next meeting being at Springfield, I trust there is not a member present at this session that will not be present, if his life is spared, at our next session, and bring as many other roadmasters with you as you can, who are not present at this time. Let us continue to push these matters right straight along. It is doing us all good, it will do our roads good, and we shall secure a still higher standing before the railroads of our country than we do to-day.

President—And I will say, as your President for last year, that I am very thankful for your kind attendance, and hope that we shall see the same number at Springfield, under the jurisdiction of our friend Mr. F. C. Clark. Again thanking you for your kindness, I will call upon the Chaplain to close the meeting with prayer.

Prayer by the Chaplain — Our Heavenly Father, we thank Thee for the railways of our land that have added so much to civilization, so much to enterprise, to business, to increase of traffic, to increase and interchange among ourselves and among the nations of the earth. And we thank Thee for the increased improvement in efficiency, safety and economy upon these ways. We thank Thee for the large and increasing number of men, strong men, faithful men, we trust, and effective men, who are being employed and who are to be employed in this service. We thank Thee for this Association, and for these men here present, and for the absent members as well. We return thanks for the favors of the past, and for the blessings of the year just now closing. We look to Thee that wisdom, and grace, and health, and strength, and effectiveness, may be granted to each one of us, and to those who shall join us in this service in time to come. Keep us, we beseech Thee, by Thy truth, by Thy power, by Thy grace. Help us ever to draw near in faith, in boldness, in fidelity. May we trust Thee, may we acknowledge Thee in all our ways. We ask it for the Redeemer's sake. Amen.

President—I now declare our Ninth Annual Meeting closed.

# MEMBERS.

| | | |
|---|---|---|
| †*Aldrich, M. W. | N. Y. & N. E. R. R., | Needham, Mass. |
| Beane, A. C. | C. V. R. R., | St. Albans, Vt. |
| †Bodwell, S. B. Jr. | B. & M. R. R., | Lowell, Mass. |
| Bishop, G. W. | F. R. R., | Athol, Mass. |
| †Braley, B. | O. C. R. R., | Bridgewater Mass. |
| †Brennan, P. D. | N. P. R. R., | Peacedale, R. I. |
| †Bryant, E. H. | O. C. R. R., | New Bedford, Mass. |
| †Clark, F. C. | H. R. R., | Falls Village, Conn. |
| †Clark, W. E. | V. V. R. R., | Charlestown, N. H. |
| †Collins, R. P. | O. C. R. R., | Readville, Mass. |
| Daggett, G. E. | N. Y., N. H. & H. R. R., | Stamford, Ct. |
| Dearden, W. F. | G. T. R'y, | Richmond, P. Q. |
| †Dickey, T. J. | F. R. R., | Boston, Mass. |
| †Drew, J. W. | O. C. R. R., | Hyannis, Mass. |
| †Ellis, W. F. | | Woonsocket, R. I. |
| †Follansbee, G. H. | C. R. R., | Keene, N. H. |
| †French, G. L. R. | B. & M. R. R., | Northampton, Mass. |
| †Garrison, D. C. | S. L. & N. R. R., | Roxbury, Mass. |
| †Greer, Sam'l | N.Y.,N.H.& H.R.R., | Westfield, Mass. |
| †Hammond, H. N. | N. Y. & N. E. R. R., | Providence, R. I. |
| †*Hathaway, E. O. | C. R. R. R., | Springfield, Mass. |
| †*Hogan, Thos. | N. Y. & N. E. R. R., | Danbury, Ct. |
| †Holbrook, F. | N. Y., N. H. & H. R. R., | Stamford, Ct. |
| †Horner, E. W. | C. V. R. R., | Rutland, Vt. |
| †Hutchinson, Wm. | B. &. M. R. R., | Nashua, N. H. |
| †Hyland, R. | C. R. R., | Keene, N. H. |
| †Jackman, E. E., | B. &. M. R. R., | Franklin, N. H. |

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†Members Present.

*New Members.

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|---|---|---|
| †*Kilcourse, John | H. R. R., | Danbury, Conn. |
| Lane, C. S., | N.Y.,N.H. & H.R.R., | Waterbury, Ct. |
| †Lane, J. S., | | Hartford, Ct. |
| †Lavoix, Chas. | B. R. B. & L. R R., Winthrop Junc., | E. Boston, Mass. |
| †Lentell, C. B. | B. & A. R. R.. | Boston, Mass. |
| †Letchworth, Sam'l | N. Y. & N. E. R. R.. | Boston, Mass. |
| Loomis, E. R.. | N. H., N. H. & H. R. R., | Hartford, Ct. |
| Ludwig, W. B., | W. R. R., | Waldoboro, Me. |
| †Lydston, E. W. | B. & M. R. R., | Lawrence, Mass. |
| McManama, J. W. | F. R. R., | North Adams, Mass. |
| Merrill, W. H. | C. N. E. & W. R. R., | Rhinecliff, N. Y. |
| †Morrill, E. | B. & M. R. R., | Lawrence, Mass. |
| †Mosher, W. T. | B. & A. R. R., | Boston, Mass. |
| †*Muzzey, L. M. | B. & A. R. R., | Chatham, N. Y. |
| †Nevens, Geo. | M. C. R. R., | Brunswick, Me. |
| †*Osgood, C. S. | P. & R. F. R. R., | Hartford, Me. |
| Patch, J. R., | C. R. R. R., | Springfield, Mass. |
| Paxson, S. C. | N.Y.,N.H.& H.R.R., | Westfield, Mass. |
| †Perkins, P. S. | N. Y., P. & B. R.R., | Providence, R. I. |
| †Post, E. K. | N. Y., N. H. & H. R. R., | Hartford, Ct. |
| *†Richmond, J. J. | N.Y. & N. E. R. R., | Willimantic, R. I. |
| †Sargent, F. M. | O. C. R. R., | So. Framingham, Mass. |
| Shanks, J. L. | F. R. R., | Johnsonville, N. Y. |
| †Shanks, J. W., | N. L. N. R. R., | Palmer, Mass. |
| †Sibley, F. E. | N.Y.,N.H.& H.R.R., | Middletown, Ct. |
| †*Sisk, John | N. Y. & N. E. R. R., | E. Hartford, Ct. |
| Slafter, C. S. | O. C. R. R., | Readville, Mass. |
| †*Smith, R. R. | B. & M. R. R., | Canaan, N. H. |
| †Spaulding, L. J., | F. R. R., | Ayer Junc., Mass. |
| †Stevens, A. C. | B. & M. R. R., | Beverley, Mass. |
| †Stickney, A. C. | B. & M. R. R., | Boston, Mass. |
| †Stone, E. E. | B. & A. R. R., | Springfield, Mass. |
| Toomey, D. | N. Y. & N. E. R. R., | Norwich, Ct. |
| †Torr, Jas. M. | N.Y.,P. & B.R.R., | Woonsocket, R. I. |
| †*Walker, John | B. & M. R. R., | Nashua, N. H. |

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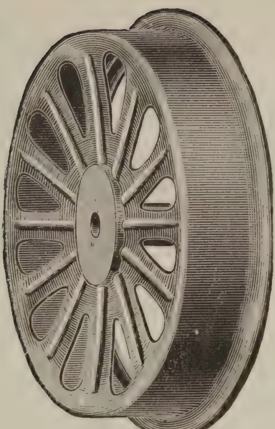
†Members Present.

*New Members.



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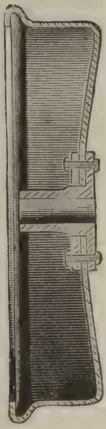
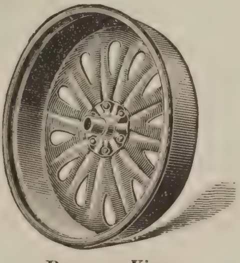


***Sectional View.***



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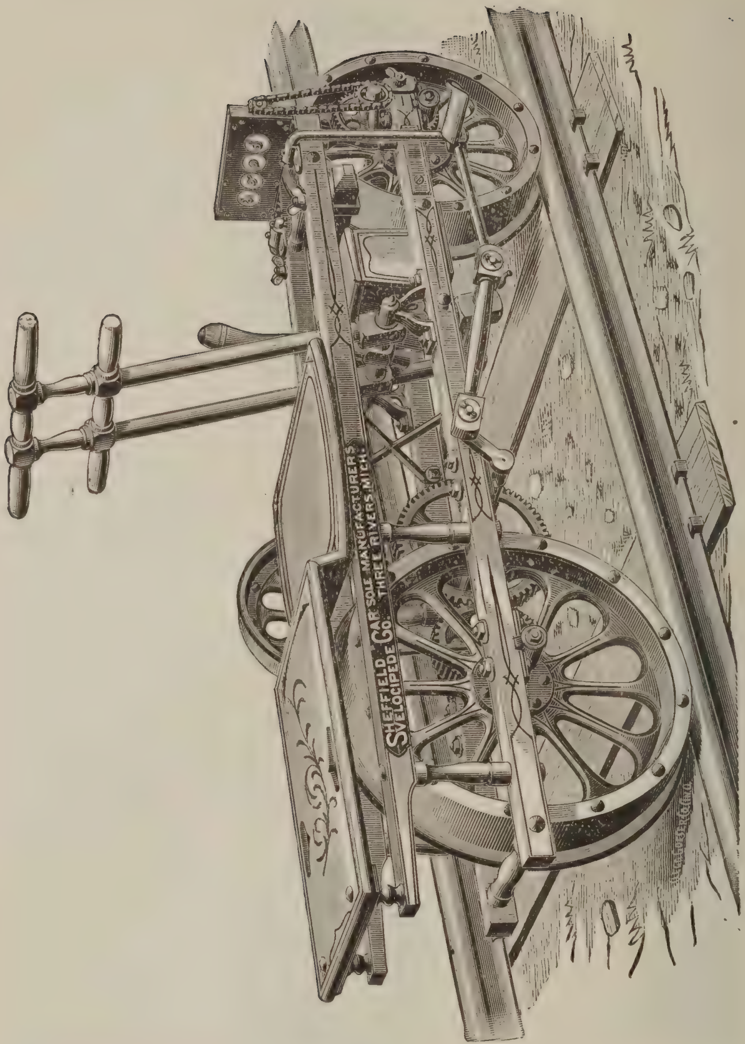
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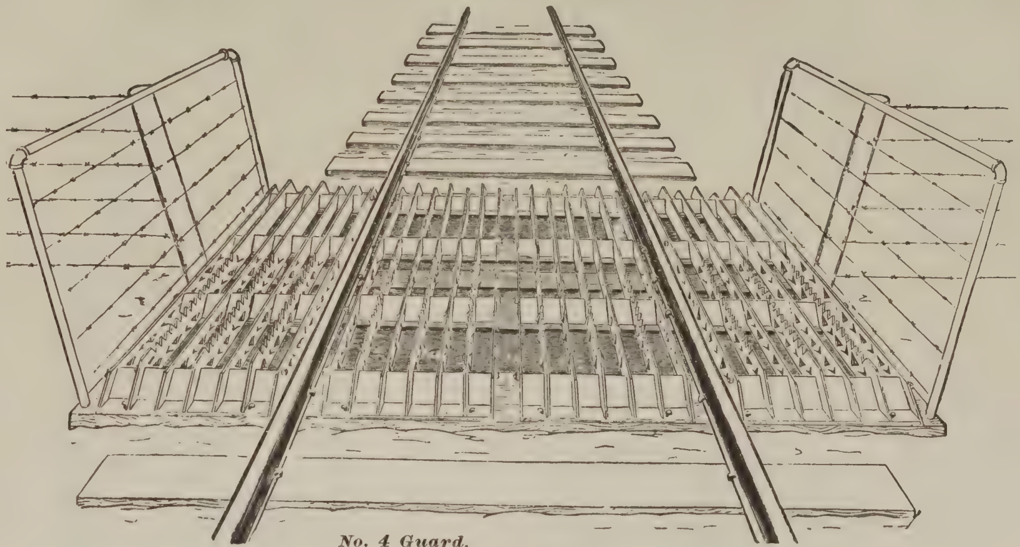

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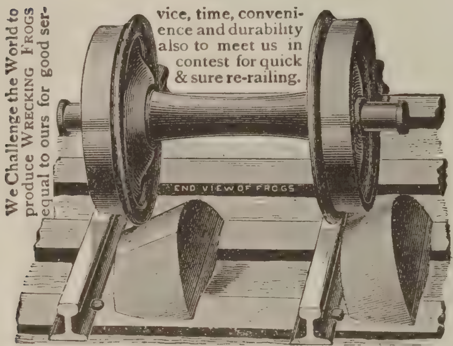
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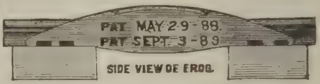

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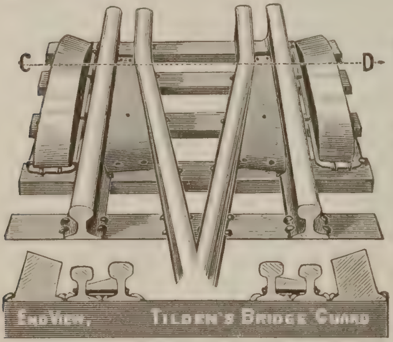
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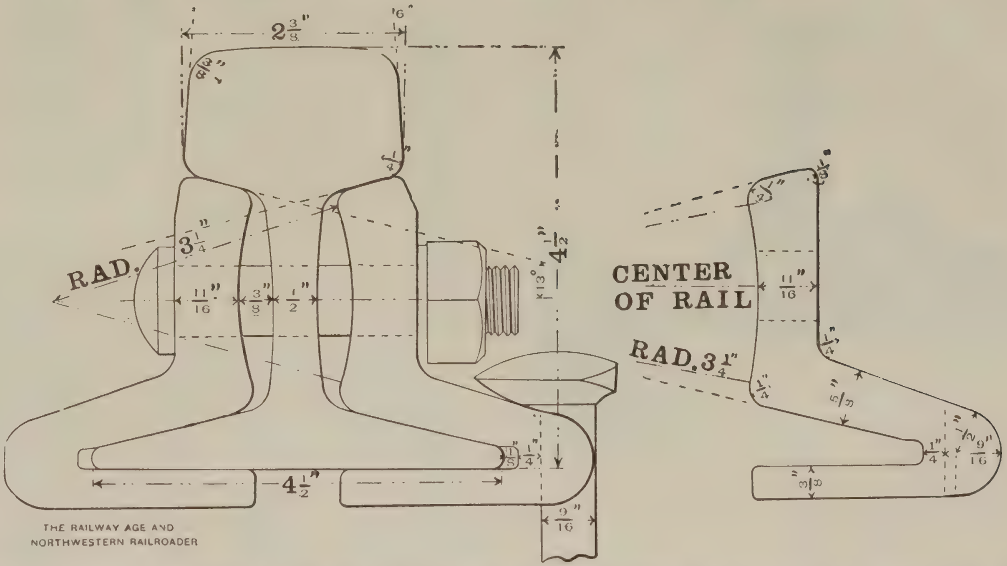

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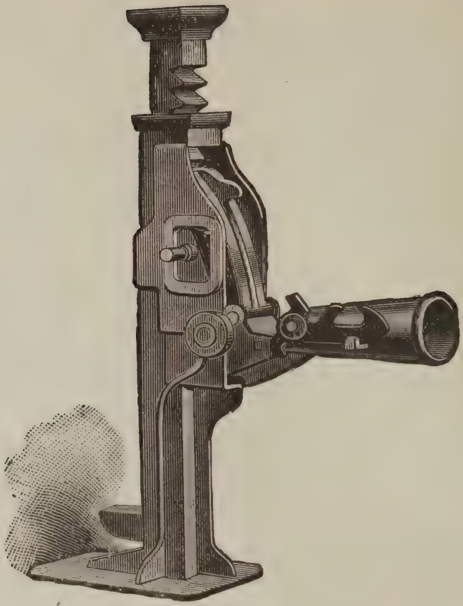
The use of this Joint will save 50 per cent. of the cost of maintenance of way, add 25 per cent. to the life of the rail and incidentally effect a saving of wear and tear on wheels and rolling stock. In use on thirty-seven roads.



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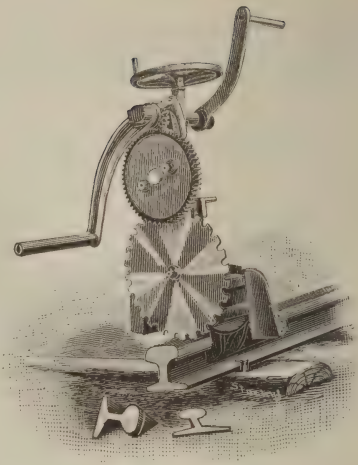
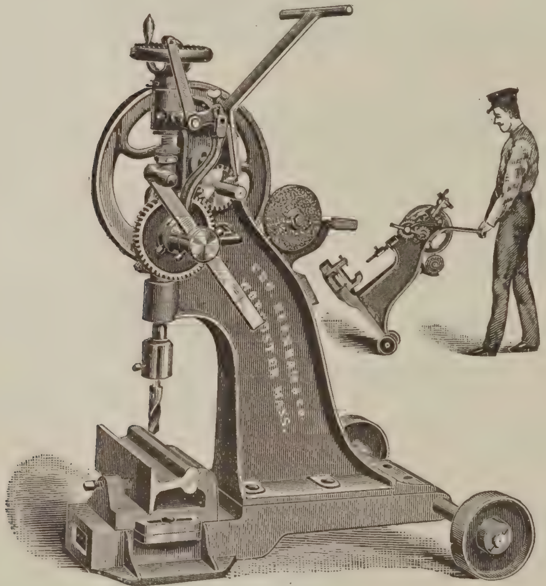


**Will cut on angles from 90° to 75° right or left.**



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### ILLUSTRATED.

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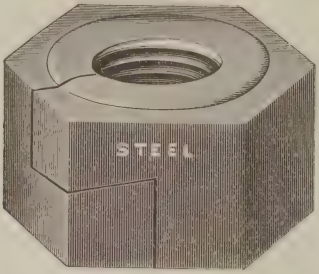

## Milwaukee, U. S. A. Wisconsin.

## WHAT IS THE ELASTIC NUT?

It is a nut made from steel with one side open, and so made and threaded that when put upon a bolt it opens slightly, thus developing a powerful grip, which enables it to withstand any jar or concussion found in machinery or other places where lock or jam nuts are a necessity. *We simply invoke the principle of elasticity in a very simple manner.*

## A COMMON NUT

*is born dead.* Its rigidity confirms this statement, and washers or other devices cannot impart life to a *corpse.*

## THE ELASTIC NUT

will do what none other will do, remain tight where put on, *even under such vibration and strain as will break the bolts.* It can be turned up over or taken off over rust by virtue of its elasticity, it not being necessary to destroy bolts to repair track as with the common nut. *It will tear a bolt under a wrenching strain and open no more than when set up for ordinary use.* It needs no washer; it is simple, strong and efficient. Washers *hide and thus deceive,* where there is any elongation or wear on the bolts. It is a truth which is forced to the front, that the only known device to take up slack of bolts is a common wrench in the hands of a common man.

## IT WILL COST

you no more than you are now paying for the common nut and nut locks; it has no extra parts to get lost and bother, and does not require the services *of a mechanic with a kit of tools to use it.* The tendency of late years in railroads has been to increase speed of trains and weight of rails, and no corresponding increase in the safety and strength of fastenings.

**THE ELASTIC NUT** comes to you as a harbinger of less wear and tear of cars, track and roadbed, and of the saving of human life by reason of such destruction of material and the breaking of rails.

**ABSOLUTE SECURITY ON BOLTS,** on track, locomotives, cars, bridges, agricultural implements, vehicles and machinery in every form, electric railroads and cable lines, etc.

Send for Samples, Address all correspondence to the Company. Correspondence solicited and testimonials sent on application. Machines furnished to make nuts with slight waste of material. Royalties for sale.

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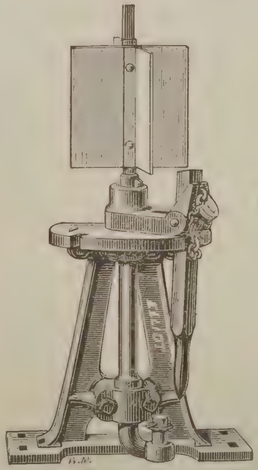

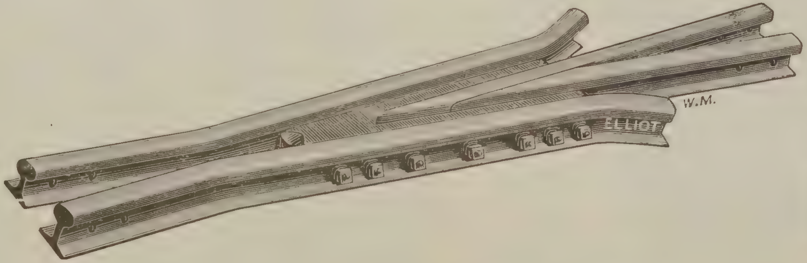

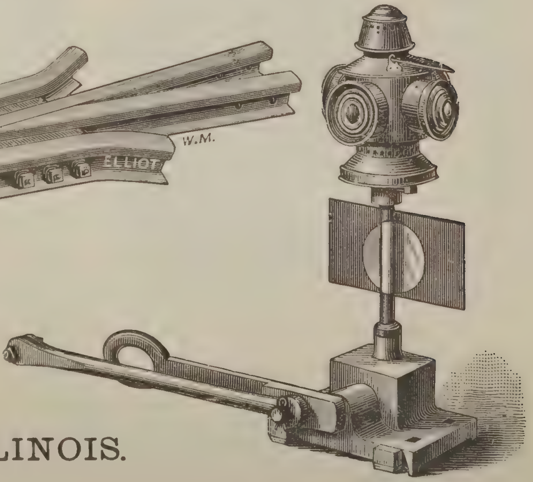

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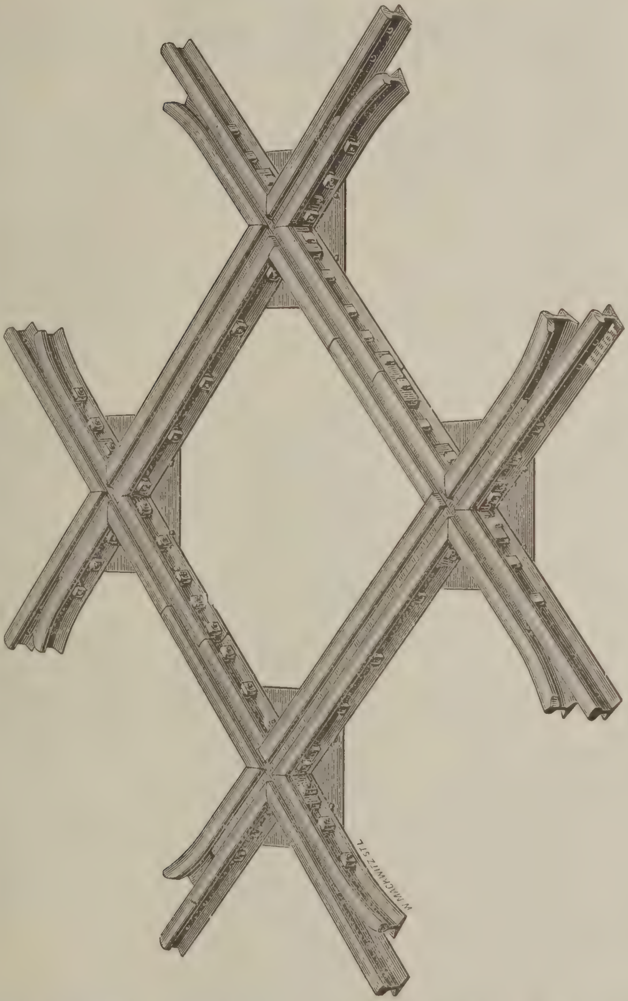
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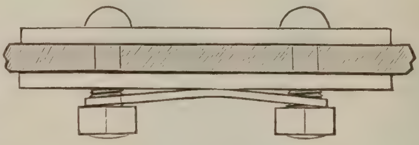
# Automatic Nut Locks

OR

# FISH PLATE SPRINGS.



Double.

It is well understood in mechanical practice that where a combination of iron plates are "screwed together with bolts and nuts, and subjected to jar, that said nuts, bolts and plates will become loose." And in no place does it appear to give more trouble than on railroad tracks, where the joints are so numerous and the jar is so heavy, by trains running over them, which causes friction, and the nuts, bolts and fish plates become loose and rattle. We find in our EXCELSIOR AUTOMATIC NUT LOCKS or FISH PLATE SPRINGS a positive remedy.

Place the springs as shown in cut, with the eyes bearing outward against the nuts, and screw them up the usual way, by which the springs are compressed against the fish plate, the two ends of the springs becoming levers pressing against the nuts ; the springs now become permanent automatic levers, pressing heavy between the nuts and the fish plate.

By this invention the loosening of the nuts, bolts and plates is prevented, and the joint is as solid as any part of the rail. They cannot rotate with the nuts, and are not easily lost or mislaid, They make a permanent, fast joint, and saves the labor of track-men screwing up nuts.

The single Nut Locks can be used on bolts for switches, as well as rail joints, and all places where distances are irregular between bolts.

They are patented in the United States, Canada, England, France, Germany and Belgium ; and we claim that they are cheaper, more durable and effective, and, being hardened and tempered, always retain their life and elasticity. And we challenge all competitors for their equal in effectiveness and durability

*These Nut Locks have been adopted by the New England Roadmasters, in Conventions held at Hartford, Conn., October 19th and 20th,* 1887, *and Boston, Mass., August* 15*th and* 16*th*, 1888, *as the best Nut Locks shown.*

In placing the double spring on the bolts the centre of spring should bear on the fish plate, and screw them up the usual way.

Sample lots furnished for trial, *free of expense*, by forwarding the distance between centres of fish plate bolts.

Correspondence and orders solicited.

## RUFFNER & DUNN,

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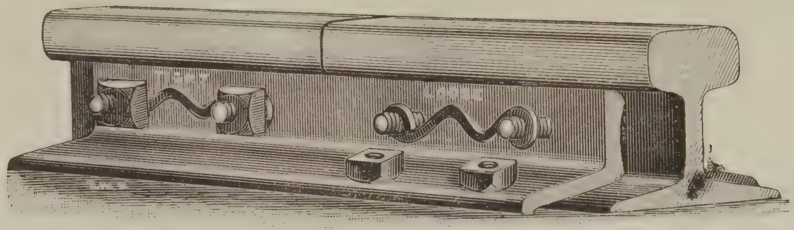
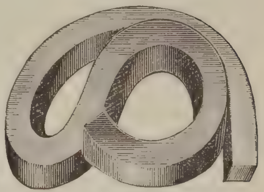
THE EXCELSIOR SINGLE AND DOUBLE

Automatic Nut Locks and Fish Plate Springs.





Single Nut Lock.

The Excelsior Automatic Nut Locks and Fish Plate Springs, the cheapest, most durable and effective Nut Locks, known in use.

Sample Lots furnished for trial, free of expense, by forwarding the distance between centres of fish plate bolts. Correspondence and orders solicited.

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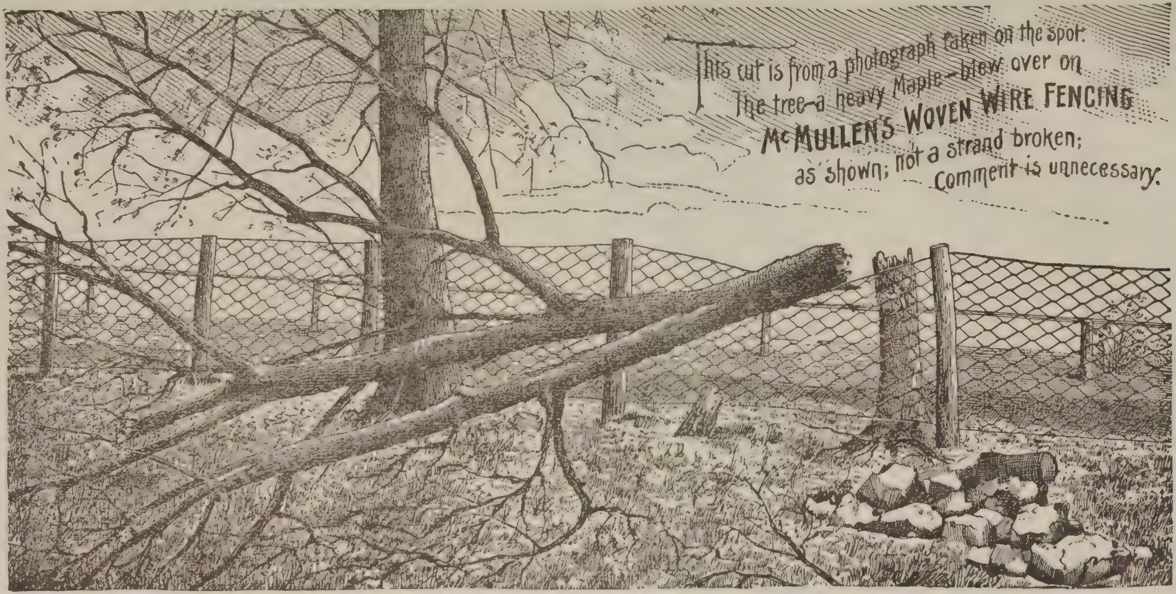
This cut is from a photograph taken on the spot.
The tree—a heavy Maple—blew over on
McMULLEN'S WOVEN WIRE FENCING
as shown; not a strand broken;
Comment is unnecessary.

Some fifty Railroads now have our Fencing in use. Special prices made to Railways and their employes.

THE McMULLEN WOVEN WIRE FENCE CO., North Market and Ontario Sts., CHICAGO, ILL.

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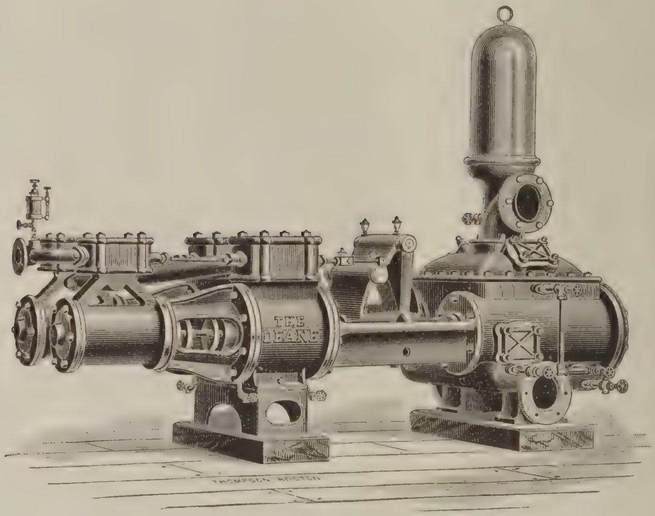
OF HOLYOKE.



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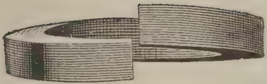
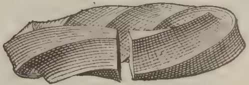
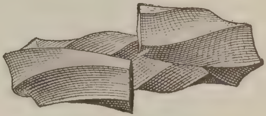
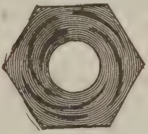
# *WHAT EVOLUTION HAS EVOLVED*
# IN NUT LOCKS.


Good.
First came the Spring without the Twist.


Better.
Then followed the Twist without the Spring.


Best.
Now we have the Twist and Spring Combined.



The Cutting Edges Imbed Themselves in the Angle Bar and in the Nut Like This Effectually Locking the Nut, without Injuring the

**THREAD.**

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Patented Nov. 8th, 1881, and Nov. 14th, 1883.

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EVERY LOCK TESTED BEFORE LEAVING THE WORKS.

Manufactured from the Best Crucible Spring Steel by the

# AMERICAN NUT LOCK CO.,

215 & 217 Biddle Street, **ST. LOUIS, MO.**

**SAMPLES FREE ON APPLICATION.**

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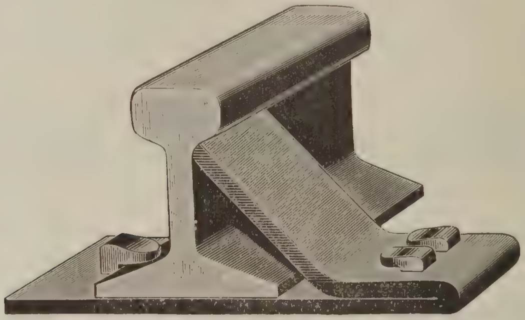
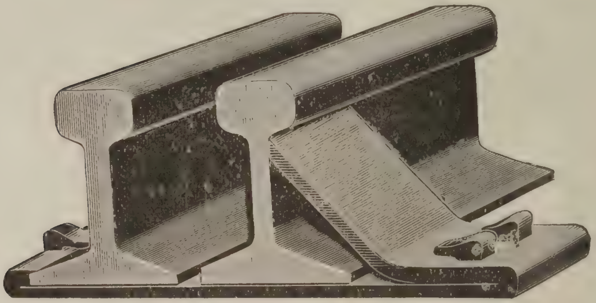
# THE EDWARDS' RAIL BRACE,

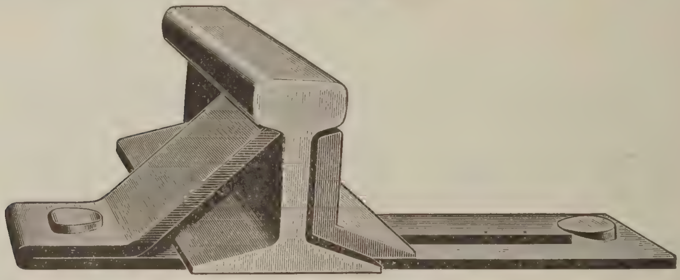
Patented Dec, 17, 1889.



COMBINED TIE PLATE AND BRACE FOR CURVES.



GUARD RAIL BRACE.



COMBINED SLIDE PLATE AND RAIL BRACE FOR SPLIT SWITCH.—SWITCH CLOSED.

*MANUFACTURED BY THE*

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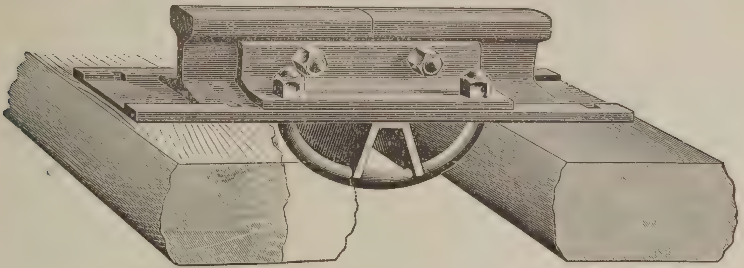

A Bridge Support Mechanically Perfect.

CHICAGO & NORTH-WESTERN RAILWAY CO.,
OFFICE ROADMASTER, GALENA DIVISION, STERLING, ILL., December 11, 1891.

*W. S. Brewster, Esq., Chicago.*

DEAR SIR : Replying to yours will say that I could not give you the exact figures as to cost of maintenance, but can say that since we have had your Joint in track, now over two years and a half, we have never had to raise a joint any more than any other portion of the rail ; in fact, the Joint seems to hold up the best. I can safely say, that we could save one man's time on each section if we had the Truss Rail-joint in use all over, but this expense is a small item compared with the battering of ends of rails, as we have them with other joints.

We have not had a low joint on this piece of track with all the hard use it has had. We moved it over onto a new bed when we graded for a second track, and an immense traffic with heavy engines, running very fast, passed over it.

I am fully convinced that we can hold up battered joints with it ; in fact, I did put one on a battered joint here in Sterling yard. It was in for one year, and wore the rails so that the batter was very slight when we renewed our main line with heavier steel. Yours respectfully,

**542 JOINTS.** E. P. EDWARDS, Roadmaster, Galena Division.

CHICAGO & NORTH-WESTERN RAILWAY CO.,
OFFICE ROADMASTER IOWA DIVISION, BELLE PLAIN, IOWA, November 30, 1891.

*W. S. Brewster, Esq., Chicago, Ill.*

DEAR SIR : In relation to the Truss Rail-joint, which is in use on my division on State Center Hill, I wish to say that I have two miles of them in use in the hardest place on my division. They were put in in 1889, and have now been in about two years and a half. They have given entire satisfaction in every particular, and are just as good to-day as the day they were put in. I have done at least fifty per cent. less work on these Joints than on any other joints I have in service, and feel safe in stating that they can be maintained at a cost of twenty-five to fifty per cent. less than any other Joint I have in service. Yours very truly,

**770 JOINTS.** SILAS H. BROWN, Roadmaster.

CHICAGO & NORTH-WESTERN RAILWAY CO.,
MADISON DIVISION, BARABOO STATION, August 29, 1891.

*W. S. Brewster, Esq., Chicago, Ill.*

DEAR SIR : I have no reason whatever to change my views in regard to the Joint. It is really receiving no care, and I failed to discover a low Joint from rear end of train this morning ; it is really wonderful—I am surprised myself—to see the amount of labor saved. S. H. Brown, Roadmaster Cedar Rapids to Nevada, Iowa Division, has some of these Joints and speaks highly of them. Yours truly,

**488 JOINTS.** J. W. WRIGHT, Roadmaster.

*If the above interests you and you want further information, write to us. We have FACTS and FIGURES that will surprise you. We are ready, and can save the Railroads of the United States millions of dollars in the wear of Rail Ends—the wear and tear to Rolling Stock, and cost of Maintenance.*

**THE TRUSS RAIL JOINT CO.,**
**Room 322 Home Insurance Building CHICAGO, Ill.**

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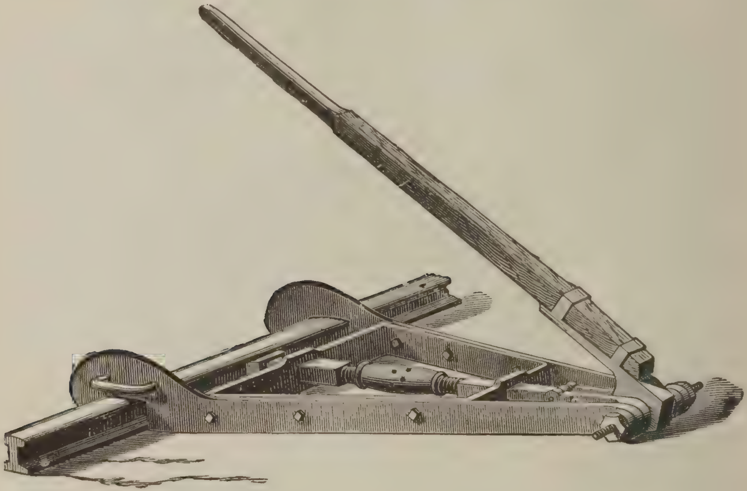
# Rail-Bending and Straightening Machine

*Made of best Wrought Iron and Steel.*



### SIZES.

No. 2—Guaranteed to bend rails 45 to 65 lbs. to the yard.
No. 3— " " " 65 to 90 " " "

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These Machines are in use on the principal railways in the United States and other countries. For testimonials and further particulars, address

**M. H. BROWN,**
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# PETTIBONE, MULLIKEN & CO. MANUFACTURERS, CHICAGO, ILL.

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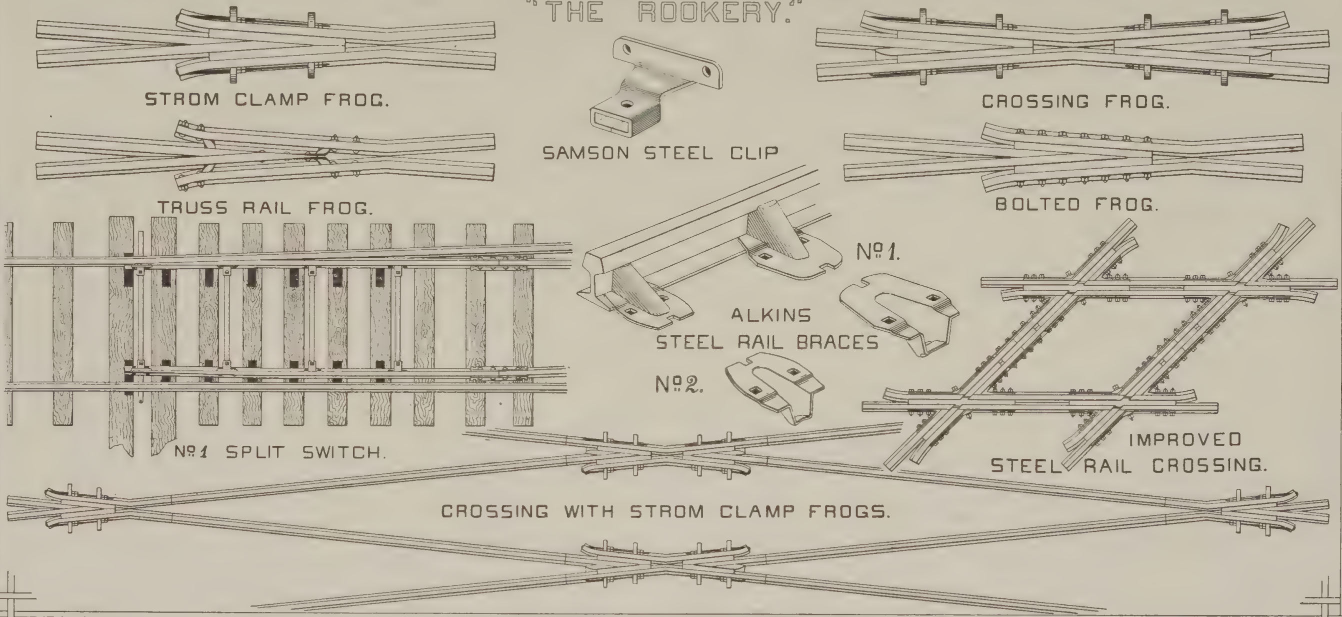
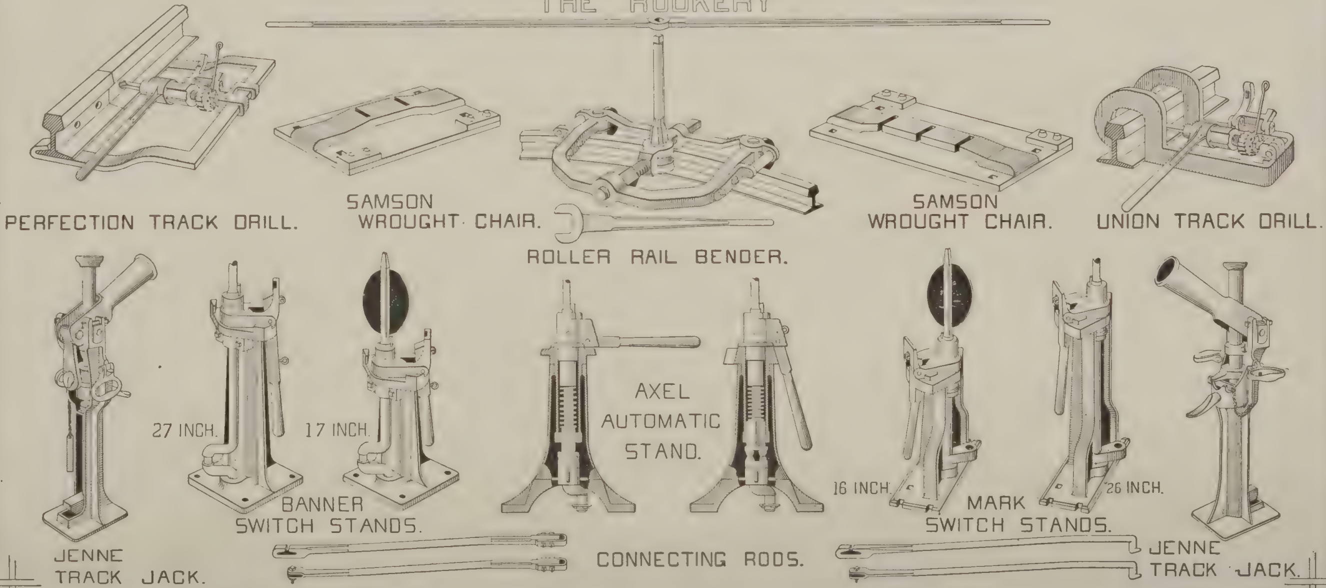


# PETTIBONE, MULLIKEN & CO. MANUFACTURERS, CHICAGO, ILL.

"THE ROOKERY"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SAMSON WROUGHT CHAIR.
UNION TRACK DRILL.
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27 INCH.
17 INCH.
BANNER SWITCH STANDS.
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16 INCH.
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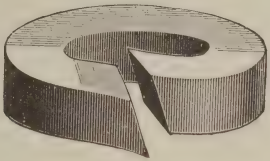
MARK SWITCH STANDS.
CONNECTING RODS.
JENNE TRACK JACK.

# The Verona Nut Lock

FOR 1892.

190,000,000 IN USE.



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*A Tempered Cast Steel Spring, with Smooth Bearing Surfaces and Hardened Engaging Points,*

**FOR USE ON TRACK BOLTS.**

Takes up Wear. Locks the Nut. Quality fully maintained.

We have sold over 15,000,000 for this year, from Jan. 1st, '91, to Jan 1st. '92, making our sales to date, Jan 1st, '92 over 190,000,000. We are keeping up the quality of steel in their manufacture, which insures a Perfect and Reliable Nut Lock. We think that the sales of the Nut Locks show their preference over all others.

WE MANUFACTURE A LARGE LINE OF

**SOLID STEEL TRACK TOOLS**

Of the best approved models and reliable quality. Price list on application. Inquires cheerfully answered.

## METCALF, PAUL & CO.

7th Ave. and Liberty St.,
PITTSBURGH.

64 and 66 S. Clinton St.,
CHICAGO.

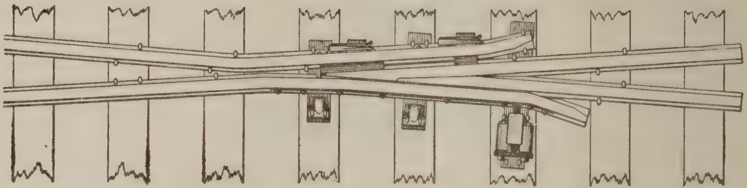
# PENNSYLVANIA STEEL CO.,

STEELTON, PA.

## STEEL RAILS All Weights. All Patterns.

STEEL SPLICES AND FASTENINGS.

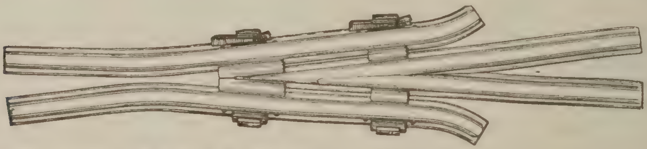
**BRIDGES, VIADUCTS, ROOFS AND BUILDINGS.**



## Spring Rail Frog, Keyed Pattern, Improved.

This Spring Rail Frog excels all others in Safety, Strength and Durability, Noiselessness and convenience in placing and maintenance ; and in main line tracks is the most economical Frog that can be used. The fixed parts are bound inside of strong clamps, which are so immovably secured, are much stronger than any other mode of fastening the parts, and may always be tightened, as parts wear, to keep everything snug and solid, and avoid rattling. The spring rail is guided and kept in place by the strongest and most efficient devices in use, the spring rail being strengthened and secured against breaking. The peculiar form of the spring rail provides for all conditions of wheels the most secure bearing and support ever attained in Spring Frogs.

The special improvements relating to the Spring Rail are also applied in various patterns of Bolted and Riveted Spring Frogs, when such are required.



The **PATENT KEYED PATTERN STIFF** Frog continues the favorite Rigid Frog, and is sold more extensively than any other pattern of Rigid Frog. It is of the strongest possible construction, simple and reliable, easy to place and keep in condition to obtain the utmost durability of the steel rails of which it is made.

## Stiff Frogs, of Various Riveted Plate, and Bolted Patterns

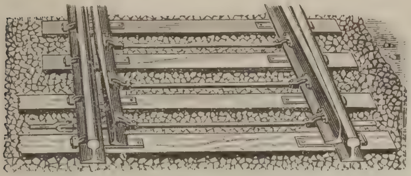
Are also supplied to many roads, and our facilities for making them, at favorable prices, are not surpassed. Various methods of fitting, as preferred.

**CROSSING FROGS** OF EVERY REQUIRED ANGLE, are constantly produced, in large numbers ; some of the most complicated character. The constructions vary according to requirements. The materials used are always of the best quality for the purpose. All filling is the toughest soft steel, specially rolled, and the bracing is of the heaviest sort.

### Combination or Slip Crossings,

Such as required in making thoroughfare cross-overs over parallel tracks ; made with the most convenient and durable arrangements for operating the Split Switches ; easily placed and satisfactory. Our experience in this line is extensive.

# PENNSYLVANIA STEEL CO.,



## *SPLIT SWITCHES*

AND

## Lorenz Safety Switches

WITH

*Interchangeable Parts.*

Unsurpassed Workmanship & Fit.

Having unequalled facilities for their production, either for quantities or qualities, invite attention thereto. Have six different (standard) patterns of construction, suited to all requirements, and make several other patterns (on specifications). Imitations of our patented special patterns are extant, of which the public are warned. Slide plates or friction plates are Steel, and Braces of Wrought Steel; both, combined, make the *Ideal Switch Plate.* Switch points fitted as required, and elevated as in Clark-Jeffery Switch when required.

## Patent Three-Throw Split Switches,

Operated wholly by one-hand Lever. Wherever it is necessary to retain three-throw switches this improvement should be used. It is justly regarded as the most satisfactory three-throw arrangement on the market.

## IMPROVED PATTERNS OF SWITCH STANDS.

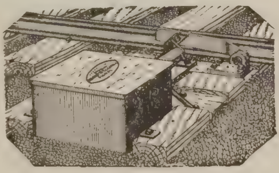
Wrought Steel Guard Rail Braces.

## MAGNETO ALARM SIGNAL for HIGHWAY CROSSINGS

*Efficiently and Acceptably Protects the Public from Accident.*

By an unmistakable warning of the approach of every train, of such vigor as to arouse the attention of the most unwary. Acts only by approach of train or engine. Gives no false alarms. Obviates employment of Watchmen, at great saving in expense.

## Makes Its Own Electricity,



Only as required, by passage of train over track levers of substantial Magneto Generators fitted in strong iron cases alongside the tracks and at required distance from crossing. As no cup batteries are used there is no freezing up in winter, nor running out of battery power. Action of Alarm incomparably better, quicker and louder than any other electric signal.

Requires only lubrication, and some little attention to condition of working parts at intervals.

## *ELECTRIC SEMAPHORE SIGNALS.*

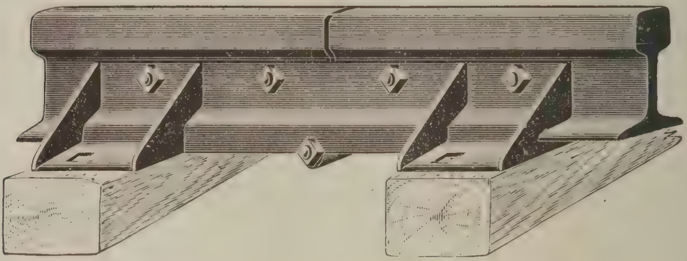
Operate at any required distance under eight miles with certainty and precision. Useful at all points where trains are to be signalled and controlled from a distance. Movement of signal affected by currents from magneto machines, which will operate any required number of Semaphores from the one station. Action of each Semaphore always known to operator however distant Semaphore is full size, mounted out doors on regular posts. Valuable addition to the signals of any station, and especially useful at junctions or other points where trains arrive from various directions.

For particulars and prices of Frogs, Switches and Signals,

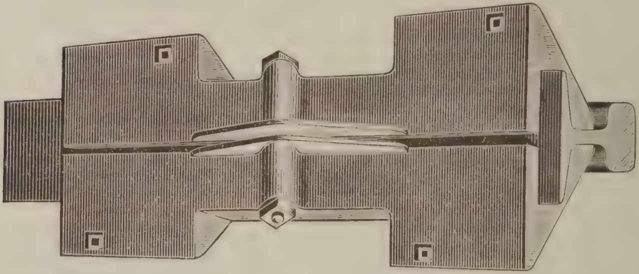
Address **GEO. W. PARSONS,**

**STEELTON, PA.** SUPT. F. S. & S. DEPT.

THE ANDERSON RAIL JOINT,



RAIL JOINT AND BRACE
COMBINED.



ONLY TWO PIECES,

Largest Bearing Surface on the Ties.

One years' Service on C. R. I. & P. R. R. tracks, with one hundred trains a day shows perfect Joint.

During this period of service no TAMPIMG, or TIGHTENING of BOLTS or NUTS was REQUIRED.

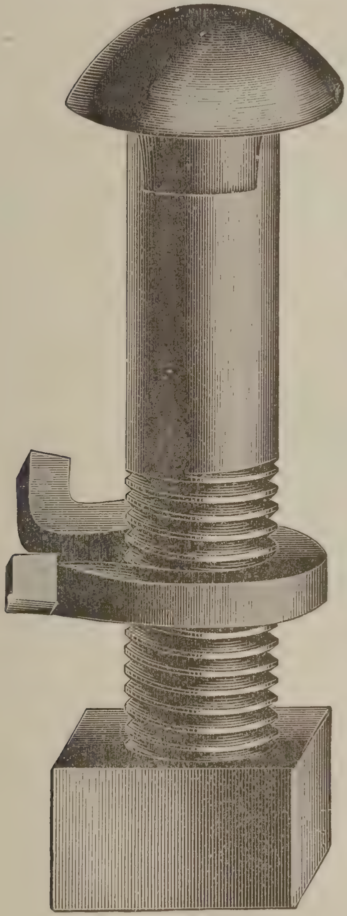
ADDRESS, ANDERSON RAIL JOINT CO.,
232 La Salle Street, - - - - - - CHICAGO, ILL.

# THE "STANDARD" NUT LOCK,

MANUFACTURED UNDER D. O. WARD'S PATENTS BY THE

# STANDARD NUT LOCK CO.

**Nos. 236 to 248 Bank St., NEWARK, N. J.**



Distinctive merits of the "Standard" Nut Lock: Fixedness of position—Cannot rotate and hammer down thread of bolt. Cannot get one end into elongated slot of angle-bar, and thereby prevent expansion and contraction of rail, and at same time lose its spring action. Unlike the double nut lock, the "STANDARD" is interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projections of foot pieces would obstruct turning up of nut to nut lock. Has more short leverage spring force against the nut than any two single coil washers. Being fixed in position it offers double the locking friction of nut locks, which when in their "*dead set*" condition turn back with nut by vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objections to the double, and covering the weak points of the single nut lock.

**Samples Free on Application.**

# RAMAPO IRON WORKS.

ONE OF ITS SPECIALTIES:

# Flange Brake Shoes.

*Fig. A.*

POSITION OF ROSS SHOE WHEN APPLIED TO WHEEL OPPOSITE OF SHARP FLANGE.

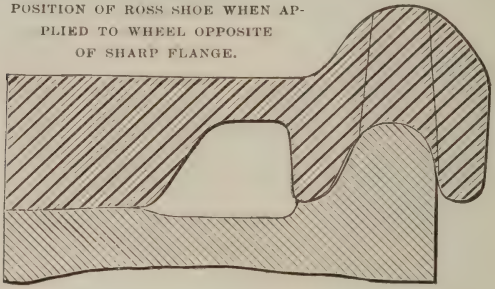


*Fig. B.*

POSITION OF ROSS SHOE APPLIED TO WHEEL WITH SHARP FLANGE.

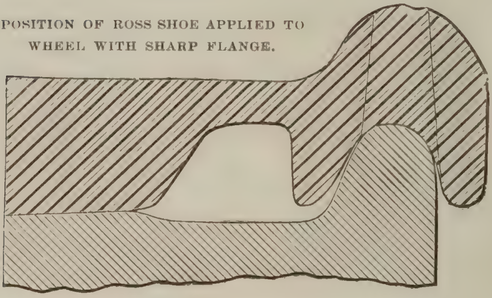
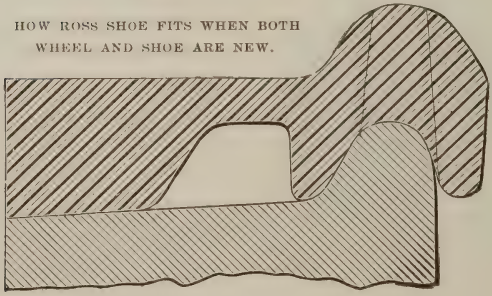


*Fig. C.*

HOW ROSS SHOE FITS WHEN BOTH WHEEL AND SHOE ARE NEW.



HERE are some of the reasons why the **ROSS BRAKE SHOE** prevents flange wear:

It is a well-known fact that the trucks of a new car are generally rigid on account of extra friction on the center-plates, journals, and other causes, thus forcing one of the flanges of the wheels against the rail until the opposite wheel has worn a slight groove in the tread, like shown in figure A; this causes a continuous rolling of the wheel in the groove first formed. Notwithstanding the truck may have become perfectly free by its frequent changes on the curves, the wheel will still roll in the same position.

The application of the Ross Shoe, as shown in figure A, will very soon wear away the raised part and second flange, and thus permit the free oscillation of the wheels on the track.

It will be seen by the diagrams herewith, that the shoe on the sharp flange wheel will not touch that part of the flange already worn until it assumes its original shape, thus keeping both flanges and tread in good condition, thus saving frogs and switches, as well as the rolling stock.

# JOYCE, CRIDLAND & CO.,

## DAYTON, OHIO,

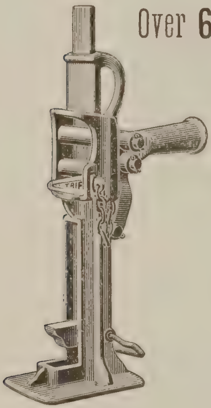
Manufacturers of J. O. Joyce's Patent

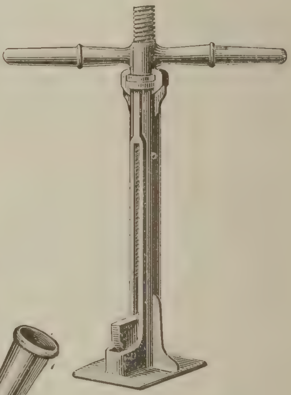
*Lever Jacks, Compound Lever and Screw Jacks*

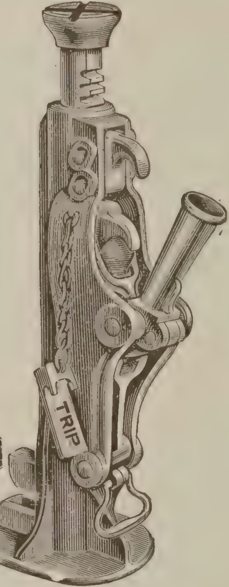
**AND BENCH VISES.**

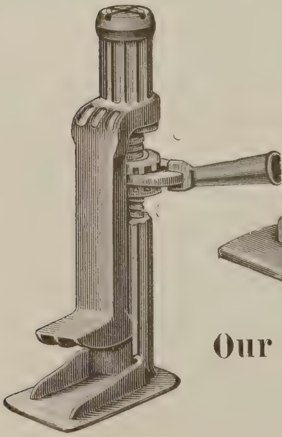
*PLEASE SEND FOR ILLUSTRATED CATALOGUE.*

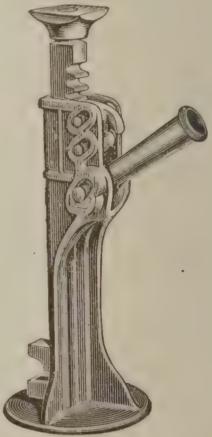
Over **60** varieties of JACKS mostly for railroad use.











**Our Track Jacks.**

# THE "WELLS LIGHT"

**WALLWORK & WELLS' PATENTS.** (Registered Title.)

## POWERFUL and PORTABLE.

*800 and 2000 Candle Power from Oil*

Now in use on over **100** Railroads.

---

*INVALUABLE FOR WRECKING*
*and CONSTRUCTION CARS.*

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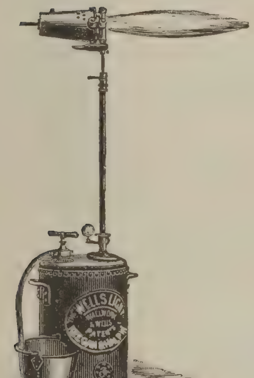


*This Letter Shows the Value of "THE WELLS LIGHT" for use of*

**ROADMASTERS.**

Flint & Pere Marquette Railroad,
Master Car Builder's Office,
J. R. Reniff, M. C. B.

Saginaw, E. S., Mich., Oct. 6, 1891.

Messrs. Keegan & Halpin, New York, N. Y.—Gentlemen:—Having had twenty-five years' experience in wrecking business, it gives me great pleasure to recommend the Wells Light as the greatest light I have ever seen for wrecking purposes.

If I had to take my choice between the two lights I have and $500, I should say, take the money and leave me the lights, and our Company would profit by the choice. I cannot say too much in praise of the Wells Light.

Yours truly,
C. D. Ball, Roadmaster,
F. & P. M. R. R.

**150 WELLS LIGHTS IN USE ON THE PENN. R. R.**

*FOR DESCRIPTIVE CIRCULAR, Address*

## KEEGAN & HALPIN,

**44 and 46 Washington St., NEW YORK.**

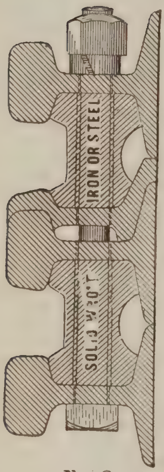
# THE WEIR FROG CO.

Manufacturers of the Most Complete Line of

## .·. TRACK SUPPLIES, .·.

And have the largest capacity of any similar concern West of the Alleghany Mountains

*WORKS : Front, Smith and Water Sts.,*
*CINCINNATI, OHIO.*

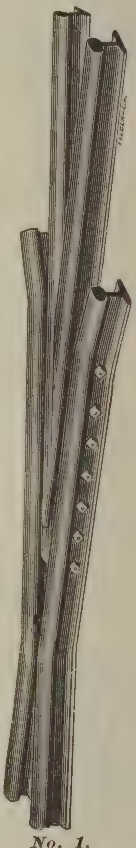


*No. 2.*

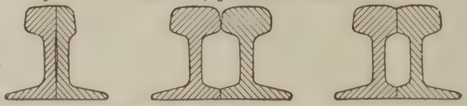
In the list of their manufactures may be mentioned Six Styles of Rigid Frogs, Eight Styles of Spring Frogs, the well-known Clarke-Jeffery Split Switch with F. C. Weir's Improvements, Crossings, etc., illustrations of a few of which are shown herewith.

First, we desire to call the attention of the Roadmasters to our Rigid Frog, which is shown in cut, and Cross Sections, Cuts 1 and 2, Cross Sections of which shows our Specially Rolled Solid Steel or Wrought Iron Filling process. These Frogs are secured with ⅞ Through Bolts, the widest National Lock Washer Co.'s Nut Locks, and Hex Nuts, making a very strong and durable job.

There having been some discussion as to the merits of the different methods of constructing points of frogs, we have concluded to show them all up, believing there will be but one conclusion by the level-headed, practical trackmen.

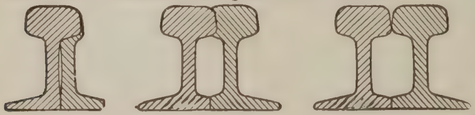


*No. 1.*



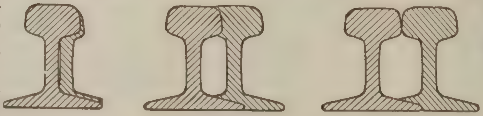
*No. 3.*

Cut Cross Section No. 3 shows original method of making points of frogs by notching the main point rail to receive short point rail.

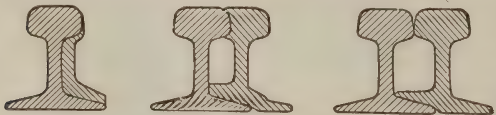


*No. 4*

Cut No. 4 shows the first improvement on this, by which the head of the main point rail was preserved but the base weakened. Cut No. 5 shows the full strength of the main point rail preserved, but at the cost of very materially weakening the short point rail, so that it has a very slim vertical support. Cut No. 6 shows the latest improvement, which is the WEIR system, manufactured and controlled exclusively by us. This is what we term our Die-formed Short Point. By this method we not only save the full strength of the main point rail, but more of the original strength of the short point rail, and produce a stronger construction of the point rails generally.

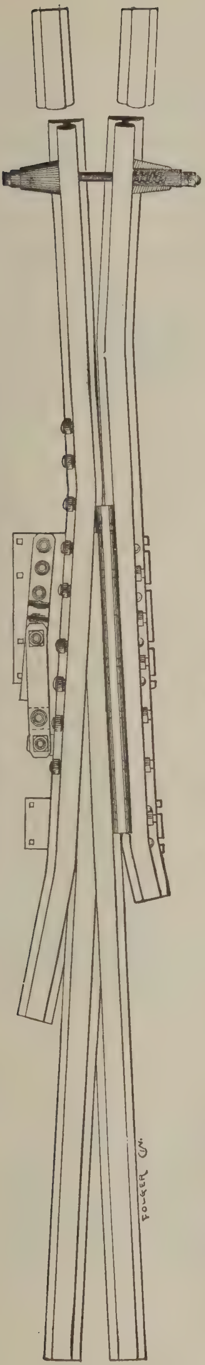


*No. 5.*



*No. 6.*

These cross section cuts are fair illustrations photographed down from full-sized drawings, therefore they can be unhesitatingly accepted as correct.

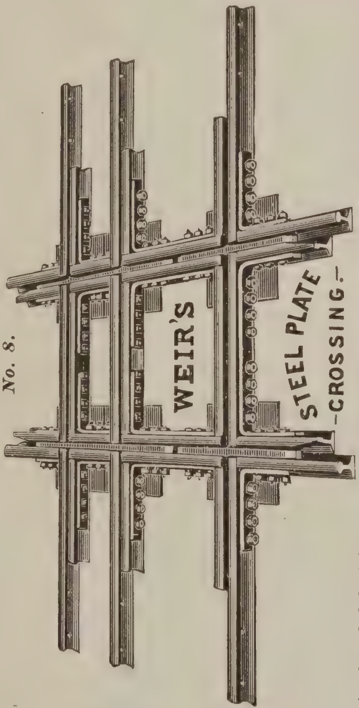


No. 7.

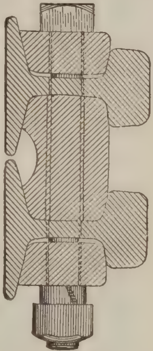
Standard Spring Frog, Desing No. 2.

Cut No. 7 shows plans of one of our designs of Spring Frogs on Steel Plates. In this style of Frog we use a bent arm, one end riveted to the Steel Plate, and the other end acting as a holding down device in connection with the double links which connect this Arm to the movable Wing Rail. We know of no other device which resists the tendency of the Spring Wing Rail to creep, and at the same time produces so little friction in the parts as this device does.

The heavy protection Bar, it will be observed, is secured to the web of the Rail with ¾ Bolts either way from the extreme point of the Frog, and this insures the holding together of the Rail in the event of its being broken, and thereby avoiding an accident. For the above reasons we believe this to be the most efficient and durable Spring Frog in the market.



*No. 8.*



*No. 9.*

Besides this we are making five other designs, some lower priced and some more expensive, but we feel confident we can suit any one, no matter what his ideas are, Blue Prints of these different designs will be furnished on application.

Our crossings made with specially rolled Solid Wrought Iron or Steel Filling as shown by Cut No. 8, and Cross Section No. 9 are very extensively used.

These Crossings are secured with specially rolled very heavy Wrought Iron Bars, which with the use of eight or more through Bolts ⅞ of an inch in diameter, Hex Nuts, the Widest National Lock Washer Company's Nut Lock, produce the strongest and most durable structure possible ; and being supported on Steel Plates at each corner the durability of not only the Crossing, but also the Ties is assured without impairing the elasticity.

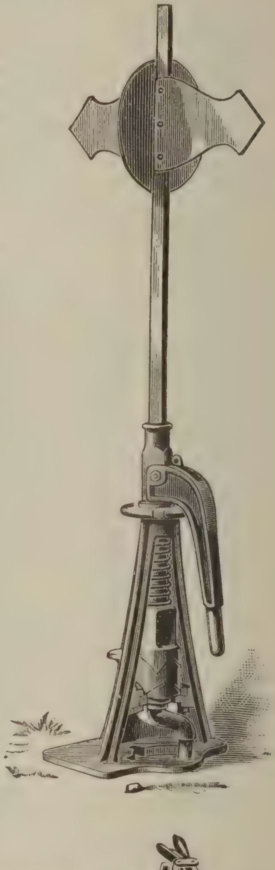
We show our patent Three-Throw Split Switch with patented Low Target Ground Throw S and by cut No. 10. This Switch presents many new and valuable features, and in Yards when Three-Throw Switches are sometimes a necessity, we can especially recommend it as being safer, more durable, and easier on the rolling stock than any Switch now in use. The Stand, which throws the switch by means of a single lever, is the only Low Target Ground Throw Stand for Three Throw Split Switches in the market, and as a Ground Throw Stand is desirable in Yards, we feel that we have a Stand especially adapted to the purpose. The fastenings which connect the Rails and Bars are the same as those used in our Single Split Switches *i, e.*, Steel and Die Formed. They come nearer an absolutely unbreakable fastening than any now in use. The opening through which the Bar passes is large enough to permit considerable lateral movement of the Bar, which allows the Switch Rails to move more freely.

Our Steel combined Brace and Friction Plates used with these have no equal, as they are indestructible, and we alone have the right to furnish them. All of the Friction Plates of this Switch are Steel, and all of them pass through under both Main Track and Split Point Rails, so that an equal bearing is always insured on both the Main Track Rail and Friction Plates.

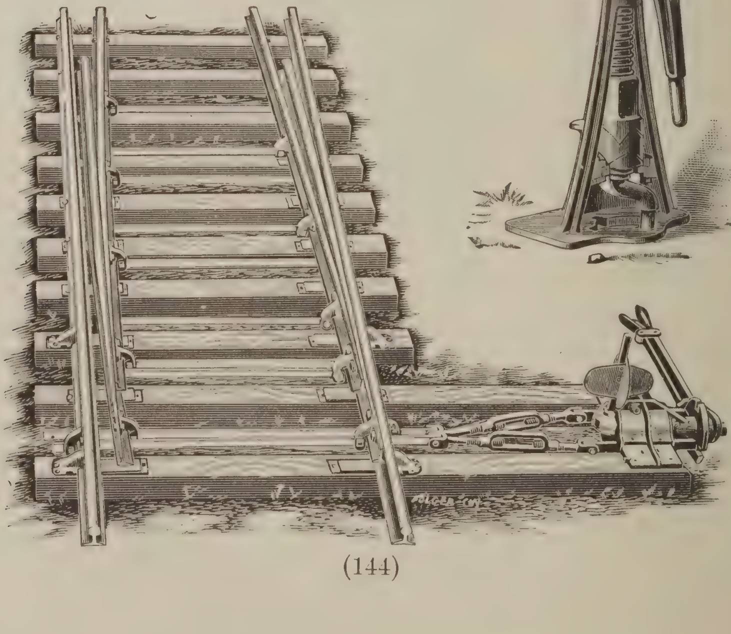
Our capacity for furnishing these Switches is practically unlimited.

Our High Switch Stand, shown on cut No. 11, is what we term our Union Pacific Pattern ; possesses the merit of not permitting tampering with the Connecting Rod when it is once put on its place and the Crank Shaft bolted up, as the Bottom Plate under the Stand prevents removal. The Locking Device in the Lever Casting at the top of the Stand is very simple and very effective, as will be seen by the cut. We make this pattern that we term High Stand, and also a pony Stand, which is not more than half its height, with any style of Target as desired.

***No. 11.***



***No. 10.***

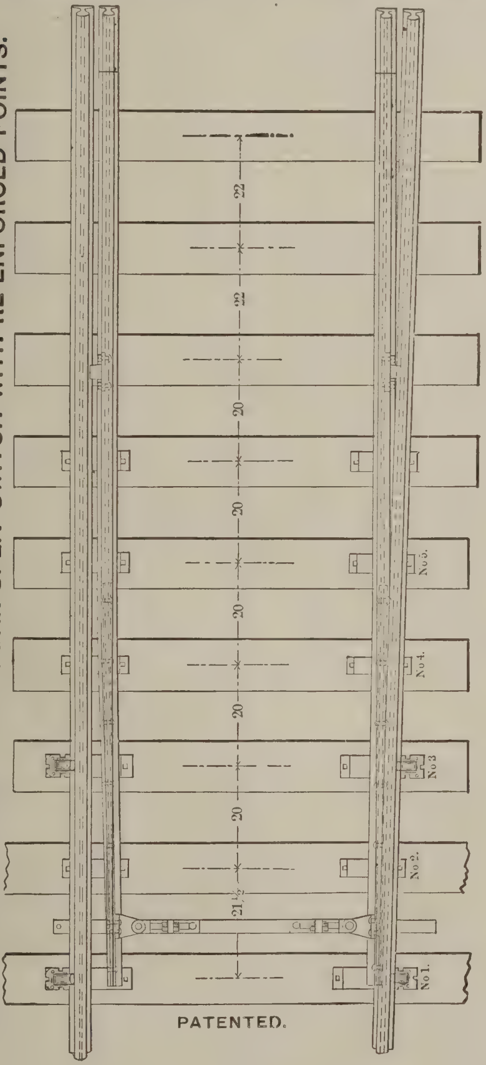


We show by cuts No. 12 and 13, our latest improvement of the Split Switch which we style Adjustable Single Bar Split Switch with Re-enforced points. As will be seen by plan and section, we use but the head rod for this Switch (doing away with the other three rods) and by means of threaded fork and nuts on same, can at all times keep points adjusted to proper throw and tight up against stock rail. It will be also noticed that we re-enforce the point rails on each side by forged iron bars of best quality, shaped to fit web of rails for a distance of about seven feet, so that in case of breakage of points, the re-enforcement will hold broken points in place until change can be made, thus preventing any possibility of derailment.

Roadmasters will appreciate the adjustable feature of this Switch, owing to the trouble experienced in keeping points at proper throw by present methods.

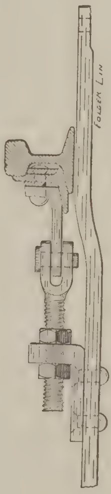
The use of but one bar is the regular practice on first class English Railways, but theirs are not adjustable, neither have they the safety feature that ours have with the re-enforcing bars.

WEIR'S ADJUSTABLE SINGLE BAR SPLIT SWITCH WITH RE-ENFORCED POINTS.

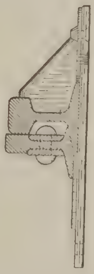


PATENTED.

12.



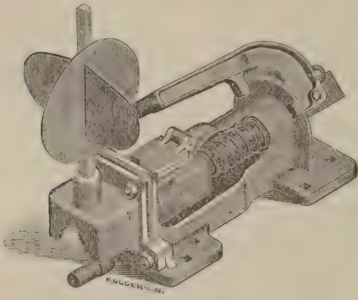
ELEVATION OF HEAD ROD. SHOWING ADJUSTING DEVICE.



SECTION SHOWING STEEL RAIL BRACES & RE-ENFORCING BAR.

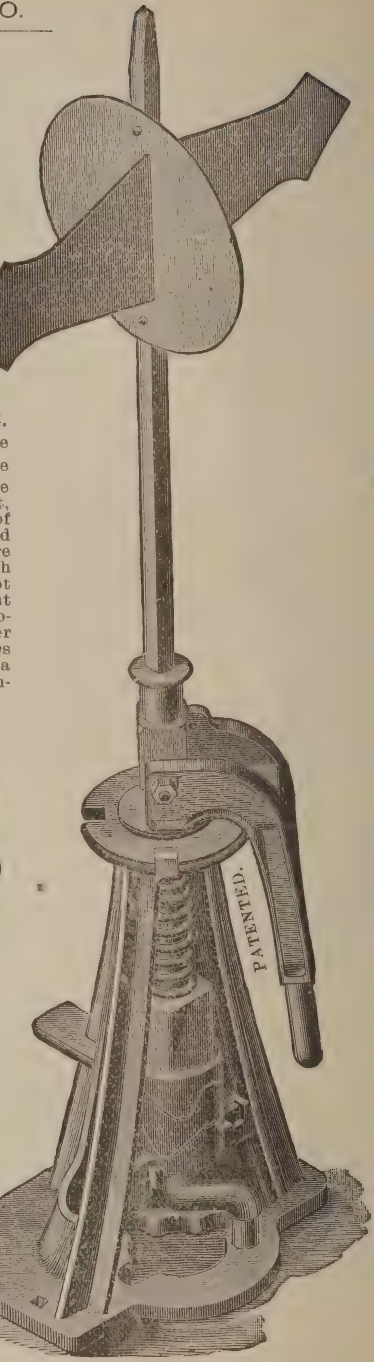
13.

Fig. 15 shows our High Automatic Switch Stand which possesses some entirely new features, the most conspicuous being the Three-part Clutch having faces of different inclinations By the use of this we are able to furnish a Stand which offers less resistance when the Switch Rail is being forced open, and at the same time closes the point Rail tighter than with any other form of Automatic Clutch Stand. Besides the advantage of using a Three-part Clutch there are one or two others worth mentioning. The Stand can be used on either one or two ties and the Target Shaft can be turned to suit the Track. The Connecting Rod cannot be taken off the Crank without unbolting the bottom bearing and lift the Crank shaft, and the Crank and Shaft are one piece of Wrought Iron with long carefully fitted bearings and joints to reduce wear. There is no strain on the Spring when the Switch is thrown by hand, and the Handle cannot be dropped unless the Switch Rail is tight against the Stock Rail. The Stand is Automatic whether padlocked or not. Another advantage is the large diameter of Clutches which reduces possible lost motion to a minimum, and the Three-part Clutch insures a double life to this part of the mechanism and Stand.



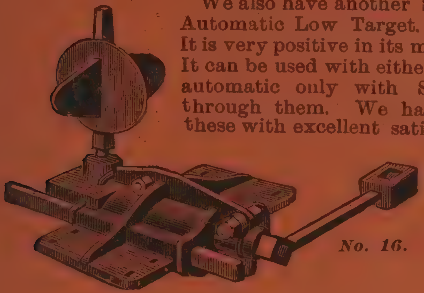
*No. 15.*

Fig. 16 shows designs of our low Automatic Stand for Yard use, and is compact and thoroughly effective, It stands on two ties parallel to the Track and the handle lies close to the body of the Stand where there is no danger of tripping over it. It has all the advantages of the Automatic High Stand as regards its operation and the general details of its parts.



*No. 14.*

AUTOMATIC HIGH STAND



We also have another Switch Stand that we term our Automatic Low Target. This is shown by cut No. 16. It is very positive in its motion, and a very durable Stand. It can be used with either Stub or Split Switch, but is automatic only with Split Switches, when trailling through them. We have furnished large numbers of these with excellent satisfaction.

*No. 16.*

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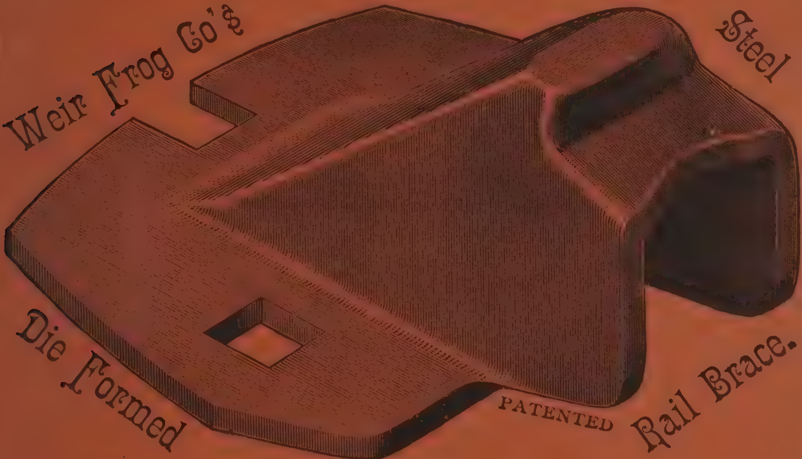

*No. 17.*

We show by Fig. 17 one of the six designs of Steel Die Formed Rail Braces which we make. They are made of Homogeneous Steel Plate ¼ to 5-16 inches thick as preferred, and are Die Formed to fit any section of Rail, and our Machinery built especially to manufacture these Braces, gives us a capacity of Twenty-four Thousand a day.

## In making orders for Frogs, Switches, Crossings or Head Chairs,

the section of Rail should be furnished, giving height, weight, distance of Fish Plate holes, gauge of Track, and angles of Frogs and Crossings. Blue Prints are requested for any or all of this work whenever they can be furnished. Promptness is guaranteed in filling orders as well as good workmanship. Estimates, also Lithographs and Photographs furnished on application. Address

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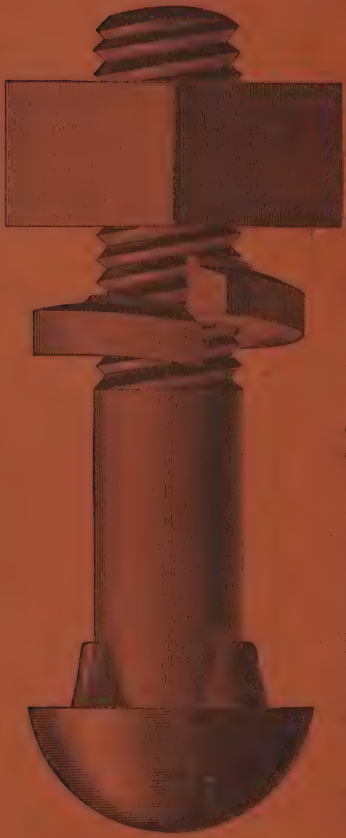
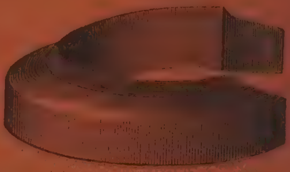
A Nut Lock Combining POSITIVE Locking of Nut, with Elasticity.





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Combining Strongest Spring Fastening possible, with postive Locking of Nut by **rib.**

Can be used on any make of bolt or nut, in any place in track.

Same bolt, nut and Lock washer can be used as **often as required.**

**The National Lock Washer** is made of steel, hardened and tempered in oil; when in use in track the rib is imbedded in nut (does not cut out metal in nut), thereby upsetting metal of nut and forcing it around bolt, and so locking nut that it cannot jar loose, acting at same time it has all the spring-holding power of the best spring nut lock made.

A trial of the **National Lock Washer** is requested, as actual use will demonstate its superiority.

Samples Furnished Free of Expense.

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# The New England

# Roadmasters' Association

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## Proceedings,—1892.

RAMAPO IRON WORKS

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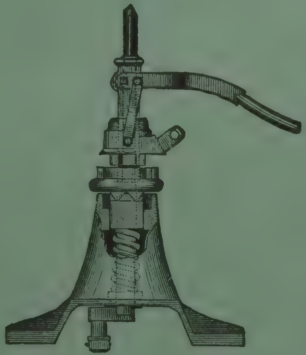
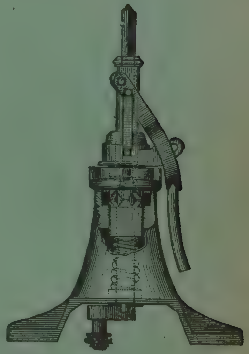


SAFETY SWITCHES,

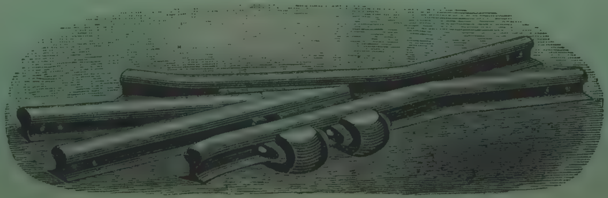
—AUTOMATIC—

SAFETY SWITCH STANDS.

Office and Works, HILBURN, Rockland Co., N. Y.



FROGS AND



CROSSINGS.

# PROCEEDINGS

OF THE

# Tenth Annual Convention

OF THE

# NEW ENGLAND

# Roadmasters' Association,

HELD AT

COOLEY'S HOTEL, SPRINGFIELD, MASS.,

August 24th and 25th, 1892.

EDITED BY THE SECRETARY.

NORTHAMPTON, MASS.:
GAZETTE PRINTING COMPANY.
1892.

# OFFICERS.

*President,*

C. B. LENTELL, B. & A. R. R., Boston, Mass.

*Vice President,*

F. HOLBROOK, N. Y., N. H. & H. R. R.,

*Secretary and Treasurer,*

G. L. R. FRENCH, B. & M. R. R., Northampton, Mass.

*Chaplain,*

E. W. HORNER, Rutland, Vt.

*Executive Committee,*

| | | |
|---|---|---|
| W. T. MOSHER, | B. & A. R. R., | Boston, Mass. |
| F. C. CLARK, | N. Y., N. H & H., | Falls Village, Ct. |
| S. B. BODWELL, | B. & M. R. R., | Lawrence, Mass. |
| F. E. SIBLEY, | N. Y., N. H. & H., | Middletown, Ct. |

THE PRESIDENT. THE VICE PRESIDENT.

THE SECRETARY.

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# PROCEEDINGS.

The Tenth Annual Convention of the New England Roadmasters' Association was held at Cooley's Hotel, Springfield, Mass., on August 24th and 25th, 1892.

Pursuant to the notice sent out by the Executive Committee changing the date for the meeting of the Convention, to the afternoon of August 24th, at 1.30 o'clock, the President, Mr. F. C. Clark, called the members to order, and spoke as follows:

President—Gentlemen, you will please come to order. We would like each one of you to dispense with smoking during the session. I have no report written out to present to you to-day. I would simply call your attention to the fact that this is our tenth anniversary, we having met in various places in New England for nine sessions, which, I believe, have been productive of much good, not only to us individual roadmasters but to the roads which we represent. The ideas that have come to us and that we have presented to others, associating them together, discussing the merits and demerits of railroad appliances and the merits of methods adopted upon the various roads in New England—and I might go further and say throughout our country—has resulted in great good to us all. And it is a pleasing thought to me, as I come before you, not the bare fact that I am the President of your Association for this session, but the fact that you had confidence enough in me at your last session to elect me for that position. We have in the executive committee business which we have transacted endeavored to be governed by that which would result in the greatest good to the Association. The date upon which we were to meet was selected as the 17th of August. Your executive committee deemed it wise and best to change that date, on account of the races occurring in Springfield during that week making it impossible to obtain the hotel accommodations desired. Your committee at a second meeting deemed it wise to prepare a collation or banquet, if you are so pleased to term it, which is to be served in this room this evening. An invitation has been sent to all the supply men to be present and accept of our hospitality. We trust that they will be with us. They have contributed largely in the past, as I previously said, towards making our sessions interesting, attractive and instructive. And not only that, but they have taken special pains to make it interesting and pleasant for the ladies; whilst the husbands were engaged in the work of the convention, they have been looking up conveyances to take them out to some resort that they might see the beauties that could be found near the point at which our convention has been held. For all these things we feel extremely obliged to them, and we expect to-night as they come in with us that they will still be entertaining, as we shall probably hear from some of them—that is, we expect to—and in a pleasant manner. We have some among them that can sing; we have some that can tell a story; we have some that can give us good advice. Among the roadmasters I may say that we have as much intelligence, as a class, as there is among any class of railroad men in this country. These are all the remarks that I will make to you at this time; at our banquet this evening there is to be a little presentation, and we may have something further to say at that time. We will now commence our regular order of exercises by the reading of the minutes of the last annual meeting. Hoping that each will endeavor to give us the best order and attention, that this may be the best session that we have had during our existence, I leave the floor.

The Secretary, Mr. G. L. R. French, of the Boston & Maine R. R., read the minutes' of the Ninth Annual Convention, and also those of the several meetings of the Executive Committee, held in the meantime.

On motion of Mr. Lentell, duly seconded, the minutes as read were adopted.

President—we will now listen to the reading of the report of the Secretary and Treasurer.

Mr. French—I respectfully submit the following :

### SECRETARY'S VOUCHER AUG. 1891, TO AUG. 1892.

| | | |
|---|---|---|
| Cash received from assessments, | $98 00 | |
| “ “ “ entrance fees, | 20 00 | |
| “ “ “ exhibitors, | 59 00 | |
| “ “ “ sale of pamphlets, | 22 50 | |
| “ “ “ advertisements, | 520 00 | |
| | | $719 50 |
| Cash paid for services and expenses of reporter, | $86 25 | |
| “ “ printing pamphlets, | 366 40 | |
| “ “ printing notices, | 10 10 | |
| “ “ postage, | 12 20 | |
| “ “ stamped wrappers for pamphlets, | 48 85 | |
| “ “ assistance mailing pamphlets | 15 00 | |
| “ “ stationery, | 4 75 | |
| “ “ express and freight, | 4 22 | |
| “ “ telegrams, | 50 | |
| “ “ Secretary's salary, | 75 00 | |
| “ “ W. F. Ellis, album, | 8 50 | |
| “ “ to treasurer, | 87 73 | |
| | | $719 50 |

G. L. R. French, Secretary.

### TREASURER'S REPORT.

| | |
|---|---|
| Cash on hand Aug. 1891, | $184 47 |
| “ rec'd from secretary as per voucher, | 87 73 |
| “ on hand Aug. 1892, | $272 20 |

G. L. R. French, Treasurer.

On motion of Mr. Bishop, duly seconded, the reports were accepted and directed to be spread upon the records.

The roll was then called; the † before names in the list of members at end of book indicates those present.

The President inquired if there were any applications for membership or any roadmasters present who desired to become members, but no names were presented.

President—Is it your pleasure to omit the reading of the Constitution and By-laws? That is a part of our programme, unless it is omitted.

On motion of Mr. Shanks, duly seconded, the reading of the Constitution and By-laws was dispensed with.

President—The next order of business is reading of communications. Are there any communications, Mr. Secretary?

The Secretary read communications from C. S. Osgood, of the P. & R. F. R. R., T. J. Dickey, of the F. R. R. and W. F. Dearden, of the G. T. R'y. expressing their sympathy with the convention, regretting their inability to be present, remitting dues, etc.

From G. H. Bryant, stating that he had accepted a position with the Q. & C. Co., in Chicago, which had two eastern representatives who would attend the convention this year.

From Samuel Letchworth's former clerk stating that owing to changes in the management of the N. Y. & N. E. R. R., Gen'l Roadmaster Letchworth, and Roadmasters Richmond and Hogan had resigned.

From E. W. Horner, saying that he had retired from the Central Vermont R. R. at the close of last year and supposed that his retirement also severed his connection with the Association.

From General Manager Kendrick of the Old Colony R. R. and H. Bissell, Chief Engineer of the Boston & Maine R. R., and Asst. Engineer D. Williams of the B. & M. R. R.

From the Railway Age, Roadmaster & Foreman, Engineering News and the Railroad Gazette, all wishing to publish the proceedings of the meeting.

The Secretary stated that he had also received a large number of letters from manufacturing concerns, evincing a lively interest in the welfare of the Association, and promising exhibits.

He further stated that he had answered Mr. Horner's letter, and told him that his services could not be dispensed with, and that he must remain a member of the Association the same as Mr. J. S. Lane, who left railroad work a few years ago but had continued a member of the Association.

President—Gentlemen, do you desire to take any action in regard to any of those communications.

Mr. Shanks—Mr. President, it strikes me that it would be well to make Mr. Horner an honorary member of this Association, if such can be done.

Mr. Clark—As I understand it, Mr. Horner may remain an active member if he wishes, and I think he does from a conversation I had with him.

Mr. French—I think he would be a great deal more desirable as an active member—and probably Mr. Shanks does, too,—if he will remain an active member ; and if Mr. Clark has had some conversation in which Mr. Horner stated that to be his wish, perhaps he would be better pleased to remain as he is.

President—I would say, gentlemen, that there is no motion before the house, as I did not understand Mr. Shanks to make a motion. I don't think there is anything in our laws that would cover the point that he would make. There would have to be an amendment. or something of that kind, before it could be done. My decision, so far as there is any decision required, is this : Mr. Horner is entitled to remain as a member, and it does not require any action on our part at the present time to allow him to remain a member. It would be, however, perfectly proper, in response to that letter which he has sent us declaring himself outside, to instruct the Secretary to write him a letter expressive of the wishes of our Association that he retain his connection and his membership with us, and if you saw fit to make a motion to that effect it would be entirely in order.

Mr. Clark—Mr. President, I make a motion to that effect, that our Secretary be instructed to write Mr. Horner of the unanimous wish of the members that he still remain an active member.

President—Gentlemen, you have heard the motion made by my namesake, that our Secretary be instructed to write to Mr. Horner conveying to him that it is the unanimous wish of this convention that he retain his connection with us as a member. Now, when I call for a vote in order to show that it is the unanimous wish, I want everybody to say that it is, and if there is anybody that does not feel that he can harmonize with us in this sentiment, he will please say "no."

The motion was duly seconded, and carried without any dissenting votes.

Mr. Lentell—I would like to ask if these three roadmasters who recently lost their position on the New York & New England understand that they can still retain their membership here.

President—Just the same as Mr. Horner can, precisely.

Mr. Lentell—While we may understand it so, Mr. President, I doubt whether they understand it so or not. Mr. Hogan expressed a doubt to me some time ago. I have not seen him since he lost his connection with the road, but he expressed the opinion that he would be obliged to retire from the Roadmasters' Association. I didn't so understand it.

Mr. Sibley—I have seen Mr. Richmond since he got through and he understands that he is out of this organization, that when he severed his connection with the road he did it with the Association also. I think it would be well to notify them all, to notify those two gentlemen as well as Mr. Horner.

Mr. French—I will read a little more of that letter. It says: "I wish to inform you that they are all good men, well qualified for the positions they have held, and so considered by General Roadmaster Letchworth, and wish to ask you to do anything you can for them at the convention or elsewhere, as well as the other members of our Association. I think Messrs. Letchworth and Richmond will attend the convention, and possibly Mr. Hogan will. He is now with Mr. Post at Hartford."

Mr. Stickney—I will say that I gave Mr. Hogan a cordial invitation to come up here, and possibly he will be here to-morrow. I told him he was as much a member now as he ever was, in my estimation.

President—I don't understand that there is any motion before the house now. I was looking at the records, and may have lost sight of it. I would ask the gentlemen if there is any motion.

Mr. Clark—I make a motion that the Secretary be instructed to send to the three roadmasters named a letter similar to that which Mr. Horner is to receive.

The motion was duly seconded and carried.

President—To satisfy you upon that point, I will read you from our by-laws: "Any roadmaster or assistant roadmaster in good standing on any regularly operated railroad in the New England States, the British Provinces and east of the Hudson River, on securing the majority vote of the Executive Committee present at any meeting of that Committee, or the majority vote of members present at any regular or special meeting of the Association, signing the Constitution and By-laws and paying an initiation fee of two dollars, shall become a member of the Association, and shall remain so as long as he pays all dues and assessments promptly, unless expelled." But the tenure of his office does not depend on the tenure of his position on a railroad. Do you desire any further action upon any of those communications? If not, we will proceed to the election of officers. Mr. Shanks and Mr. Clark, will you please act as tellers? Our laws declare that our officers shall all be elected by ballot. There is no provision for nominations. I believe it is in harmony with good judgment and good taste to have an open nomination. Some of our roadmasters present might not be acquainted with the proper party or parties. Of course they could give expression to their wish, but it might make it more harmonious and I would therefore assume the right to ask for nominations for President.

Mr. C. B. Lentell of the Boston & Albany R. R. was nominated by Mr. Clark for President.

No further names being presented, the President declared the nominations closed.

On motion of Mr. Clark, duly seconded, the Secretary was authorized to cast the vote for the convention, and a ballot being taken, Mr. C. B. Lentell was declared elected President of the Association for the ensuing year.

President—It is with pleasure I announce to you that you have elected Mr. C. B. Lentell of the B. & A. R. R. your next President. Mr. Lentell, what have you to say in response ?

Mr. Lentell—Mr. President and members of the Association, I am a poor speechmaker ; I don't know that I ever made a speech in my life. I thank you all for the honor you have conferred upon me by electing me President of this Association. It is an honor that I have not aspired to. It has not been in my line of business. I am not used to that kind of work. However, Mr. President, I will accept that position, and thank you all for the honor you have conferred upon me. But in doing so, I want and shall expect the hearty co-operation of all members of this Association, so that we can preserve the good name which the Association has. Mr. President, as I am no speechmaker, I beg leave to take my seat.

President—You will now please nominate for Vice-President.

Mr. Bishop nominated F. Holbrook of the N. Y., N. H. & H. R. R.

Mr. Shanks nominated J. W. Drew of the O. C. R. R.

Mr. Clark nominated A. C. Stickney of the B. & M.R.R.

Mr. Stickney nominated W. T. Mosher of the B. & A. R. R.

A ballot was taken, with the following result : Whole number of votes cast 22, of which Mr. Holbrook received 11, Mr. Drew 4, Mr. Mosher 4 and Mr. Stickney 3.

The President declared that there had been no election, and ordered a second ballot.

Mr. Drew—before you go any further I would like to say that I shall have to decline anyhow, and I have several reasons for it, my health, and ability, and everything else. You will vote for somebody else.

President—You have heard what Mr. Drew said. If you recognize the fact that he looks like a sick man, and does not indicate proper ability, then, of course, you must act in accordance with his wish, unless he positively refuses.

Mr. Clark—I believe it has been the rule heretofore not to accept any refusal of that kind.

A second ballot was then taken, with the following result : Whole number of votes cast 24, of which Mr. Holbrook received 18, Mr. Drew 2, Mr. Stickney 2 and Mr. Mosher 2.

Mr. F. Holbrook was declared duly elected Vice-President of the Association for the ensuing year.

On motion of Mr. Mosher the election of Mr. Holbrook was made unanimous.

President—You will now nominate for Chaplain.

Mr. Clark nominated E. W. Horner.

There being no further nominations, on motion of Mr. Clark, duly seconded, the Secretary was authorized to cast the vote of the convention for Mr. Horner, and a ballot being taken Mr. Horner was declared duly elected Chaplain for the ensuing year.

President—You will place in nomination a Secretary and Treasurer.

Mr. Shanks nominated G. L. R. French, of the Boston & Maine R. R.

On motion of Mr. Shanks the Vice-President was directed to cast the vote for the convention for Mr. French, and a ballot being taken Mr. French was declared duly elected Secretary and Treasurer for the ensuing year.

President—You will now nominate for the Executive Committee. Your Executive Committee is to consist of seven members, the President, Vice-President, Secretary and Treasurer and four others to be elected.

Mr. Clark nominated W. T. Mosher of the B. & A. R. R. as the first member of the Executive Committee, and on his motion the Secretary was directed to cast the vote of the convention. A ballot being taken, Mr. Mosher was declared duly elected the first member of the Executive Committee for the ensuing year.

For the second member of the Executive Committee Mr. French nominated F. C. Clark of the H. R. R., Mr. Brennan nominated S. B. Bodwell, Jr., of the B. & M. R. R., and Mr. Lentell nominated G. W. Bishop of the F. R. R.

A ballot was then taken, with the following result: Whole number of votes cast 20, of which F. C. Clark received 9, G. W. Bishop 8, S. B. Bodwell 2 and W. E. Clark 1.

The President declared that there had been no election.

Mr. Bishop—The year that I was in the chair and on the Executive Board for the year following there were some things went into the report that I would like to have looked over beforehand, and they would not have been in there if I had remained on the Committee. I think the retiring officer should be on the Committee every time. Therefore, I request all to vote for our President, that he may be able to send out his year's work and present it to the public as he would like.

Mr. French—I think it is quite necessary that the retiring President be on the Executive Board, for the reasons Mr. Bishop has stated, but as we have got to adjourn at five o'clock this afternoon, and we have a great deal of work that we wish to take up in the shape of discussion, I move that the three additional names mentioned for the Executive Committee, Mr. F. C. Clark, Mr. S. B. Bodwell, Jr. and Mr. G. W. Bishop, be voted upon at the same time, unless there other candidates to be nominated. We all seem to agree that we would like to have those three members serve on the Committee, and if we can make that one ballot we will save a great deal of time.

President—I would say, gentlemen, that I was expecting when the second member was elected it would follow the same course as with the first member. Not being able to do that by the presentation of a second name, I had to call upon you to prepare your ballots for the second member of the Executive Committee. You have balloted once for the second member, and until that ballot is completed by the election of the second member it will be impossible for us to proceed with the election of several at a time. After the election of the second member you can then vote, if you wish, or ballot for the two remaining members together, but not for the second member.

Mr. Stickney—If it would be in order, I would make a motion that the Secretary be directed to prepare and cast the ballot of the convention for Mr. F. C. Clark as the second member of the Executive Committee for the ensuing year, if that is in order.

President—That is hardly in order.

Mr. Clark—If there are no objections wouldn't it be ?

President—It would, if there was no objection, but it would require a vote of the body and the unanimous or two-thirds consent.

Mr. Bishop—I think this thing is pretty thoroughly understood now, and the quickest way out of it is to proceed to a ballot.

President—I think the best way is to follow our Constitution and By-laws. Inasmuch as we have commenced to ballot, you will find no trouble if you just proceed with the election of the second member with the usual ballot. If you understand that it is the wish of your Association that any one member should hold the second position, you ought to be able to control it just as well with your ballot as you would by a vote. It will take but a few moments, and let us have it in accordance with the Constitution.

A second ballot was thereupon taken, with the following result : Whole number of votes cast 21, all of which were cast for F. C. Clark. The Vice-President therefore declared F. C. Clark of the H. R. R., duly elected second member of the Executive Committee for the ensuing year.

President—As the time is speeding away very quickly, I will now make my ruling for the other two; you can now ballot for the other two if you wish.

S. B. Bodwell, Jr., was nominated by Mr. Clark, and F. E. Sibley by Mr. Post, for the third and fourth members, respectively, of the Executive Committee.

On motion of Mr. Clark the Secretary was instructed to cast the vote for the convention for the gentlemen nominated. and a ballot being taken S. B. Bodwell, Jr., of the B. & M. R. R., and F. E. Sibley, of the N. Y., N. H. & H. R. R., were declared duly elected the third and fourth members, respectively, of the Executive Committee, for the ensuing year.

## REPORTS OF COMMITTEES.

President—That closes, I believe, your election of officers for the ensuing term. We will now proceed with our regular order of business, being the reports of committees. I will call, first, for the committee's report on the following: "Comparison of heavy rail sections now advocated for use with light rail sections: should there be an increase of labor to roadbed to get full life and value from use of the heavier rail?" The members of the committee are E. E. Stone, chairman, E. K. Post and J. R. Patch. I will call for the report from this committee—Mr. Stone?

Mr. Stone—I have handed the report to the Secretary, who will read it.

President—Mr. Secretary, please read the report.

The Secretary read the report of the committee, as follows:

Mr. President and members of the New England Roadmasters' Association:

The committee appointed on the question, "Comparison of heavy rail sections now advocated for use with light rail sections; should there be an increase of labor to road-bed to get full life and value from use of the heavier rail?" are of the opinion, that it does not require on the whole an increase of labor with the larger rail sections, other conditions being the same, to obtain these results. Although it may require an increase of labor in the straightening, curving and handling preparatory to and at the laying of the rail, but we are of the opinion that this difference would be nothing compared with the labor saved in the natural life of the rail. Besides an increase of the smaller rail sections is required to keep pace with the heavier engines and rolling stock as a matter of safety, and to obtain better results as there is less liability to deflection between the supports with the larger rail, which would cause less motion of the cars, thereby insuring better riding track with the same labor. It would also decrease the undulations or the wave motion in the rail which causes the track to creep or move in the direction of the traffic; this, sometimes, is a great source of annoyance and labor to the track men. We believe this would be partially allayed with the larger and stiffer rail. You could get a stronger and stiffer splice joint with the heavier rail which would help to keep the joint on the same plane with the rest of the rail; thereby correspondingly decreasing the continuous pounding at the joint where they are lower than the rest of the rail, which is so detrimental to the life of all rails where this occurs.

You would have fewer broken rails, thereby insuring less liability to accidents from such causes. With the larger rail sections you could get a wider head giving more wheel base, making more material to wear away which would help to increase the life of the rail. You also get a wider base which would prolong the life of the ties as the rail would not cut in to the tie as quickly with the same traffic as with the narrower base, causing a corresponding reduction of labor in the renewal of ties. As to the surfacing, cleaning and the other labor incidental to section work, we cannot see where there would be any more labor than with the smaller rail. Taking into consideration these things we have mentioned, with the larger and heavier rails. the renewal of rails would not come as often as with the lighter ones, which in itself is a great saving of labor, owing to the amount of extra labor required preparatory to the laying of new rails and the extra spacing of ties, adzing and general work of getting the new rail in good condition in as short a time as possible, which is a necessary and most essential thing to do with any new rail to get full life and value from the same. Then if these periods of renewal can be extended from three to five years longer with a heavier rail than they would with a light rail under the same traffic and afford better and safer track, we are of the opinion that the extra labor required in the preparation and handling of the heavier rail would be nothing compared with the labor saved by the longer period of renewals, stronger splice joints and stiffer and wider rails and the more satisfactory results that would accrue therefrom.

This committee were requested to propose a list of questions, pertinent to the main question, which we give below :--

1st. What should be the maximum weight of the rail to the yard ?

2d. What proportion should the base of the rail be to the height ?

3d. Should the same number of ties be used to the mile with the heavy rail as with the light ?

4th. Would there be a need of the tie-plates with the heavy rail, owing to the wider base, to get full value from the ties ?

E. E. Stone, B. & A. R. R.
E. K. Post, N. Y., N. H. & H. R. R.
J. R. Patch, C. R. R. R.

On motion of Mr. Clark, duly seconded, the report was accepted, and laid on the table for future discussion.

Mr. French—Mr. President, I think that, as has been customary, we should accept all the reports, and then they can be handed to the railroad journal men, who can be taking copies of them as they always do. After all the reports have been accepted and laid upon the table, we can take them up separately for discussion.

The President retires temporarily, and the Vice-President takes the chair.

President *pro tem*—I will call now for the report of the committee on "Small culverts and cross drains : best material and form for same." Committee, J. W. Shanks, chairman, and J. M. Torr. Is the committee ready to report ?

Mr. Shanks read the report of the committee, as follows :

Mr. President and Gentlemen :—The subject of small culverts and cross drains is of interest to all of us, also the best material and form of same, and we, the committee, respectfully recommend as follows :

1st. The best material for small culverts is stone laid in cement.

2d. They should be arched over when practical, so to do.

3d. That culverts should be either flagged in bottom the entire length, or paved with stone set on edge, and interstices filled with cement grout.

4th. For cross drains we would recommend that they be constructed of good, sound plank, either white oak, yellow pine or chestnut.

We herewith submit ten questions in regard to small culverts and cross drains:

1st. What is the best method of covering small culverts, when not practical to arch over?

2d. Shall small culverts be open or covered?

3d. In covered culverts, what depth of ballast should there be between top of covering and bottom of ties?

4th. In small open culverts, what is best material and form of stringers for same?

5th. Shall small open culverts be guarded so as to avoid trouble in case of derailment?

6th. How near together shall ties be placed on small open culverts and should guard timbers be placed on ties locking same in position?

7th. In what proportion shall culverts be built in regard to width and height?

8th. How far apart shall cross drains or water boxes be placed (on double track road)?

9th. Shall cross drains or water boxes be open or covered?

10th. What is best method of protecting ends of culverts from undermining and prevent water from getting behind walls of same?

Respectfully submitted,
J. W. Shanks, N. L. N. R. R.
J. M. Torr, N. Y., N. H. & H. R. R.

On motion of Mr. Post, duly seconded, the report was accepted and laid upon the table for future discussion.

President *pro tem*—Now I will call for the report of the committee on the question: "Fire damage: how to lessen the number of fires, and best method of adjusting claims." Committee, G. W. Bishop, Chairman, R. P. Collins and W. E. Clark.

Mr. Bishop read the report of the committee, as follows:

The committee appointed to report on question of Fire Damage, submit the following report:

1st. We recommend that the location be cleared of all old ties, plank and barks; and kept so by removing all old material as fast as renewals take place.

2d. We recommend that all brush, weeds and grass, be mowed between the middle of July and middle of September and burned as soon as possible after cutting of same.

3d. It is our opinion that the netting should be thoroughly examined at the end of each trip as much as any other part of the locomotive.

4th. We suggest that the section foremen be provided with proper blanks which will give full particulars of all fires, and that they be required to fill one out for each and every person who has had property damaged by fire, and promptly forward same to roadmaster of his division for his approval; after which claim agents should have in charge the settlement of the same.

Very respectfully submitted,
George W. Bishop, F. R. R.
R. P. Collins, O. C. R. R.
W. E. Clark, V. V. R. R.

On motion of Mr. Sibley, duly seconded, the report was accepted and laid upon the table for future discussion.

President *pro tem*—The next question to be reported upon is, "Is not the use of cheap and therefore inferior material and tools detrimental to the general economy of a road?"

Committee, George Nevens, Chairman, S. B. Bodwell, Jr. and W. H. Merrill. Are the committee ready to report?

Mr. French—I would suggest, as Mr. Bodwell has been called out, that we drop the fourth question until he returns, as he is the only representative of that committee in attendance at the convention, and take up the discussion of the first question.

President *pro tem*—Gentlemen, you hear the suggestion of our Secretary, that we proceed to discuss the first question, which is, "Comparison of heavy rail sections now advocated for use with light rail sections: should there be an increase of labor to roadbed to get full life and value from use of the heavier rail?" The question is now open for discussion. Gentlemen, we would like to get this question started, and would be pleased to hear from you in regard to heavy rail section, concerning the labor required to lay it and maintain it, and get your different opinions. I will call on Mr. Shanks for his opinion in regard to it.

Mr. Shanks—Mr. President, I am in favor of a heavy rail section, for the reason that our rolling stock has been increased in weight to such an extent that the small rail section that we have been using is too light to carry the traffic. I think that a great difficulty with many of our rail sections is that there is not base enough to our rails, they are not wide enough on the base. We are laying a rail on the Central Vermont road of 75 pounds to the yard, 5 inches high, and 4¾ inches base. It is an excellent rail, but the proportions are not right, the base is not wide enough for the height of it. It is liable to roll over on curves, necessitating the cutting down of the ties in order to keep the rail right side up.

President *pro tem*—I hope the members will take part in this discussion without being called on; the principal point in this question is whether it requires more labor to maintain a heavy rail than a small one. That seems to be the principal point to be brought out. I don't suppose there is any one present here who will deny that we all need a heavy rail section. I would call on Mr. Drew.

Mr. Drew—I have been connected with a road where the traffic has been carried on a very small rail, and the consequence is that it cuts the ties badly. I do not consider that a heavier rail would involve so much labor as a small rail. Furthermore, a heavy rail, with more base, would stand upright better. I am on the Cape Division of the Old Colony, and I came over the Boston & Albany today. I don't think their surface averages any better than ours does, but the track rides a great deal better, there is more bearing to the wheels. A heavier rail I don't think would take any more ties or wear out as many as a light rail. In about three or four years a light rail with 4 inches base, cuts into a tie 1½ inches, and consequently the tie is worn out or rots out, and it has to be replaced. The labor of straightening, etc., a big rail I do not consider amounts to enough to talk about in relaying or putting a heavier rail in place of a light one. I don't think there would be quite as much labor required to keep the track up with a heavy rail as with a light rail, and I know the track rides very much better.

President *pro tem*—I would call on Mr. Bishop.

Mr. Bishop—Mr. President, I consider that every argument that could possibly be brought to bear on this question would be in favor of a heavier rail; I don't know of any argument that there could possibly be in favor of a lighter rail. The difference in curving and handling rails of 60 pounds or 90 or 100, would be but very little, and after the heavy rail was once laid it would be a long time before there would be any need of its being relaid, while a light rail would have to be relaid much sooner. After a heavy rail is once laid it makes quite a difference in the results. It saves labor in surfacing, in alignment, and in gauge. It prolongs the life of the ties and spikes. I think a heavy rail, to the extent of not to exceed 100 pounds to the yard, would be a great saving, and the sooner a corporation will adopt a heavy rail the sooner they will begin to make a saving by a reduction of expenses in the track department.

President *pro tem*—Mr. Stone, what have you to say on this subject?

Mr. Stone—This is a question which I think hardly needs discussion. There is no doubt that a heavier rail is much better in all respects than a lighter rail.

The President returns and takes the chair.

President—Gentlemen, the first question proposed by your committee reads as follows, "What should be the maximum weight of rail to the yard?" Now, we are not only prepared to listen to your remarks, but hope that each and every one here present will be prepared to express his opinion. We are aware at the same time that there must of necessity be a diversity of opinion in this matter. However, I am not going to render a decision before you discuss the question. We await your remarks.

Mr. Drew—Mr. President, in the section of the country where I am I should prefer 75 or 85 or 90, whatever they would give us, because we use 50 and 55 where I am. The traffic is not what it is on the Boston & Albany, of course. But the heavier the rail the cheaper it would be to take care of the roadbed, and it would be very much smoother and better. I should put ties just as thick under the heavy rail as under the light one, and after you got it up good you would not have to be working at it all the time. I believe our folks are laying 80 pounds or 83, 75 and 65. I should be satisfied with any of those, and if I could have my preference would choose the heavier rail. I concur with brother Bishop in every sense of the word, in regard to a heavier rail.

President—I want to read all these questions to you, and I do it for this purpose, so that when any point is before the convention you may know what point you are talking to; that is to say, the more we systematise the work in our convention, the more shall we conform to what we have to do out upon the road. As a rule, our presidents, vice-presidents, general managers and superintendents want everything systematic and in order. The committee have presented to you questions in order, and we give them to you in the same way in which they present them. Now, I will read to you the questions that they have presented; then as we take up the first question and discuss that, or present our opinion, it may not afford an opportunity for so much discussion upon some point as you will find later on; you will then better understand what is before you for your opinion at the present time. "First: What should be the maximum weight of rail to the yard? Second: What proportion should the base of the rail be to the height? Third: Should the same number of ties be used to the mile with the heavy rail as with the light? Fourth: Would there be a need of tie-plates with the heavy rail, owing to the wider base, to get full value from the ties"? The question now before the convention is: "What should be the maximum weight of rail to the yard?"

Mr. Drew—I should say that would depend upon the traffic. On the road that I am on we have just about half as much traffic as they do on the Boston & Albany, and we should not require as heavy a rail as they do. They probably want a rail that weighs 95 or 100, but the 80 pound would be heavy enough down on our huckleberry road on the Cape. I should say it would depend somewhat on the traffic of the road. The New York Central wants a heavier rail than we do in some parts of New England where we have but ten or twelve trains a day.

President—I would call upon Mr. Mosher.

Mr. Mosher—It was in my mind, Mr. President, to say that we have not found any rail yet that is any too heavy. What the limit is of course we don't know, because we have not had anything heavier than 95 or 100 pounds. That weight would seem to be satisfactory for the work they have to do now. Of course if the traffic should increase that might not suffice, but it is sufficient for us now. It seems that 100 pounds is about the proper standard. Of course if the work is light you would not require that weight and a lighter rail would answer.

President— Mr. McManama.

Mr. McManama—I agree with the several roadmasters who have spoken. In speaking of the heavy rail, I think that nothing less than 95 or 100 pounds to the yard will do for the heavy cars and engines they are running now. I think it ought not to be anything less on those lines—say, the Boston & Albany, or the Fitchburg, or any of those roads that do a large business. The cars seem to be getting heavier every day, that is, larger, so that I think all of those roads will have to come to it to do the business later on.

President—Mr. Shanks, of the New London Northern—what have you to say in regard to the maximum weight of rail ?

Mr. Shanks—Mr. President, I have just been stating that. Now, as near as I can strike the thing is, that I would make the rail section in proportion to the weight of my machinery. If I had engines of 100 tons, I would make the rail 100 pounds to the yard. When we ran engines that weighed fifty tons, a fifty pound rail did very well. We are running them now on the New London road of 78 tons, and we need a seventy-five pound rail or more to carry them well. A few years ago a car was considered capable of carrying ten tons. I see them now carrying 60,000 pounds—thirty tons. It seems to me that if they are going to increase their tonnage and the weight of their cars and machinery, it is a necessity to increase the heft of the rail. As to the care of the same, it is my opinion that a heavy rail will decrease the expense of keeping up your road. But, as another brother said here, I would put in just as many ties under the rail, no matter what the weight might be. My idea is to put in 2,900 to 3,000 ties to the mile to hold your rail up, and I don't know of any better way to do it. I don't know of any better way than this to meet the tonnage that they are crowding on to the road.

President—Allow me one question. Do you intend by your declaration that the weight of your rail per yard should be equal in pounds to the number of tons weight of your heaviest locomotive ?

Mr. Shanks—That is precisely what I meant.

President—Now I am going to call you by name if you do not get up without, so far as I know you, and I shall have to call upon Mr. Stickney.

Mr. Stickney—Mr. President, as far as this heavy rail question is concerned, I have nothing special to add to what has been said. I have nothing heavier than seventy-five pounds to the yard. The Boston & Maine has quite a line of seventy-five pound rail now in, five inches high, and five inches base. There is one thing that has come to my mind in regard to these heavy rail sections, or, in fact, any rail section, that it don't make but a little difference how much you increase the weight of the rail section unless you increase the quality of the material in the section. I received last year some of the seventy-five pound rail, and I would about as soon have a fifty-six pound old Cambria rail, with its good wearing qualities, as the seventy-five pound, and I think it would wear longer. If we cannot have first-class quality it makes but little difference what the weight of the rail is. I mean, of course, by that, that a ninety-five pound rail if it is of poorer quality than the sixty pound rail would not be in good proportion. We need a heavier rail, and we need it of the very best quality that expert rail makers can decide on. I don't feel able to decide that question myself, but I can tell a rail that I like. We need better material in our rails, and of a more uniform character, on our roads.

President—We have with us to-day one gentleman whose road I passed over to-day, a portion of which was laid with a heavier weight of rail. I don't know that I have been informed as yet as to the weight of the rail. On this end there is some of the original rail, I judge. I would like to hear from Mr. Post of the New York, New Haven & Hartford road.

Mr. Post—I often wish in conventions that I had been born an orator, instead of being tall, or something of that kind. We have on our division seventy-four pound rail, partly laid with old rail, which has been in twenty years or more. We have some seventy-two pound rail which has been in the track about ten years. This rail is 4¾ inches high, and it has a base of 4¼ inches. It is in good shape to-day, after being used ten years with a heavy traffic. It is all in good, fair condition, and the running surface is very fair. Of course we have stone ballast; but I don't think that if we had a rail laid right along in there that weighed 100 pounds—that is, if we should put two rails right on the same tie, seventy-five, eighty-five or eighty—you may put it eighty—and 100 pounds, that you would get any more benefit out of the 100 pound rail than you would out of the eighty. I think that an eighty-five pound rail is heavy enough for any railroad in New England at the present time. I think that if you should lay an eighty-five, ninety-five or one hundred pound rail right in at the same time, that they would all be ready to come out at the same time, and the extra weight that you put in is only money thrown away, in my estimation. I may be wrong, but it looks to me that way. Sixty pound rail at the present time is rather light for heavy traffic, but in my estimation an eighty-five pound rail will wear and do all that can be expected of it, and give as much service as a 100 pound rail.

President—I would like to hear a word from Mr. Merrill of the Central New England road. And I want to ask you, gentlemen, as you speak upon these questions, that you will speak loud enough and distinct enough, so that the stenographer can catch your words, and if you are, like myself, a little hoarse, just come a little nearer, because we all want to hear. Don't be afraid of your own voice, we are none of us thin skinned.

Mr. Merrill—Mr. President, I should be in favor of an eighty pound rail, and I should prefer that to anything lighter. We have laid considerable of the seventy pound rail and some of the eighty, and I should like the latter and prefer it to the seventy pound. We have some very heavy engines, and the traffic is heavy, and our sixty pound steel is wearing out a good deal and bending. I should not be in favor of any lighter rail than the eighty pound.

Mr. Clark—Mr. President, I should like to ask Mr. Merrill the number of ties he uses to the mile, and the quality of his ballast. I mean under the sixty pound rail.

Mr. Merrill—Well, we allowed about 2,000 to 2,300 to the mile under the light steel, but we have put them in thicker now since the traffic has increased, the heft of it, a great deal. We are putting them in now about 3,000 to the mile. As to our ballast, a good deal of it is mud—dirt.

Mr. Clark—I don't think that you would have had any sixty pound rail bend, or had any trouble with it, if you had had your ties 3,000 to the mile.

Mr. Merrill—A good deal of our steel has bent. Perhaps it would not if we had had the ties thicker, but it was laid for a light traffic. In a good many places the heavy engines have bent the rail.

President—We have with us to-day one who has had charge of some road that was recently laid with a heavier rail. Although he has just been shaking his head to me, yet I want to know from his own lips how that steel is working, the benefit that he finds from maintaining the road-bed with the seventy pound rail over that of the fifty-six pound rail, with which the road was formerly laid. I now call upon Mr. John Kilcourse of the Danbury Division of the Housatonic railroad.

Mr. Kilcourse—Mr. President, I find that by using seventy pound rail it is far easier to keep in surface and line than with the lighter rail; and I think that if it was a little heavier that it would be still easier to take care of.

President—How much heavier?

Mr. Kilcourse—At least fifteen pounds. I think that with an eighty-five pound rail we would have much less labor to take care of it.

President—Mr. Greer, of the New York, New Haven & Hartford road.

Mr. Greer—I don't know as I can add anything to what has already been said. Last year I thought ninety-five pound was a little bit large. There are some points about it yet that I have not got quite over. That is, when you get a rail that wears off you have got a large percentage to throw away at half a cent a pound. On the division where I work, with the locomotives we have got now, I believe that seventy-five and eighty pounds would be a pretty large rail, and it would probably satisfy me.

Mr. Shanks—Mr. President, I would like to hear the opinion of some of these gentlemen as to the base of the rail, it is a very important question.

President—We have not got to that point yet, that comes up in another question, the second question, "What proportion should the base of the rail be to the head?" I now ask for volunteers upon the first question, "What should be the maximum weight of the rail to the yard?" We have had an expression of opinion from a good number—is there anything further to be said upon that point?

Mr. Hathaway—Mr. President, I can't say what the maximum would be, but of course we all know a large beam will carry a heavier load than a small beam, and a heavier rail section should carry a heavier load than a lighter one. But we are limited in our rail sections by the ability of the rolling mills to roll perfect rail. We are not limited in the weight of our locomotives and cars. I should say that the heavier rail would require more work than the lighter rail, simply for the reason that we have got something that is more valuable in our track, and something that we should take care of. But to get the same surface in the heavier rail that you do in the lighter rail, it seems almost absurd to say that it would require more work.

President—Any further remarks upon the weight of the rail section ? If not, we will pass to the second proposition.

Mr. Clark—We have all been talking about the maximum weight of the rail, and have not said anything about the minimum weight. Now, I am not in favor of a rail of less than seventy pounds, nothing less than that, and as much heavier as they can afford ; but I would want it a little better than we are getting, I think. Mr. Mosher may be able to tell us something about the quality of the ninety-five pound rail. I think I have seen some failures in the ninety-five pound rail ; it may not have been in the material, but in the workmanship. I would like to hear from him about the quality of the rail, and the couple of failures I saw on the Boston & Albany road.

Mr. Mosher—The new ninety-five pound rail of the Boston & Albany is probably the hardest rail that has been manufactured for their use. It has about fifty one-hundredths of one per cent. of carbon, and the rail next heaviest that we still have in use has only about thirty one hundredths of one per cent. of carbon. That additional amount of carbon is supposed to give additional elasticity, tensile strength and hardness. The difference between the two sections is about twenty one hundredths of one per cent. in favor of the ninety-five. But this matter of the maximum weight of rail we cannot say anything about. We don't know how heavy rails can be made, but we can say how heavy we think the lightest rails should be that we want to use. We think seventy pound would be too light for ordinary traffic, and from what we know about rails nothing is too good for heavy traffic.

President—If there is nothing further upon this part of the report, we will pass to the second proposition, "What proportion should the base of the rail be to the height?" I would ask Mr. Bishop, an ex-President of our Association, to give us his opinion as to the proportion of the breadth of base to the height.

Mr. Bishop—Mr. President, you have taken me rather unawares, and I hardly know what to say. I have changed my ideas recently upon the shape that a rail should have, that is, the quantity that should be put into the head of the rail, of the stem, and of the base. I think that a rail not to exceed one hundred pounds, five inches high, with a six-inch base, is desirable, if it is practicable to roll such a rail. I believe that five inches high is high enough to give it sufficient strength, and the wider you can have the base of a rail and have it practical, the less cutting of ties there will be, less adzing of ties, and rolling of rails in, and the less labor it will require in every way. I should say a rail five inches high, and six inches base, from ninety to one hundred pounds to the yard, would be a good section.

Mr. Shanks—Mr. President, for ten years I have been advocating this very rail that the gentleman last on the floor has given us an idea of. He is the first roadmaster that has really agreed with me, and I think that if the railroad companies would all stand out that the rolling mills would have no trouble in making a rail as stated, five inches high and six inches base.

Mr. Mosher—I understand the rolling mills have no trouble in rolling any shape that is wanted. They did have a great deal of trouble in having a uniform quality in the rail. The great amount of metal in the head of the rail will enable them to retain the heat at any point they want. Heretofore they have found it difficult to obtain a uniform temperature and hardness through the rail. It strikes me that a rail which is about as wide on the base as it is high is about the proper thing, perhaps a little wider than it is high ; and if you want to have it wider there are two or three different kinds of tie-plates that will do it, and perhaps others will be made that will do it better.

Mr. Clark—As I understand, the rolling mills do not wish to roll a wide base rail, because they have more seconds. They are not so particular about the quality. It is on account of the seconds. If you have a wide base, they are liable to have more flaws and to throw out more rails. Now, I should advocate a rail as wide as they can consistently roll and get perfect rails, and not less than the height of the rail, and as much wider as possible.

President—Mr. Stickney looks as if he had something to say upon that point.

Mr. Stickney—It occurred to me while Mr. Clark was speaking, that as regards the question of rolling they will make just what they can the easiest, the section they can make with the least seconds, and the section that has the most dollars in it for them. The rail used now on the Boston & Maine is five inches high and five inches base. I can't say how they will stand as regards rolling out on curves, because we have not had any long enough where it had been laid properly. Some that was not laid properly is rolling out now, but that is not the fault of the rail. I think that if the rolling mills have a proper price paid to them they will live up to almost any specification you have a mind to give them, if they get dollars for it.

Mr. Clark—I think Mr. Stickney misunderstood me. I did not wish to leave it to the rolling mills ; I wished to have the specification prepared by the railroad company.

Mr. Stickney—I misunderstood you.

President—I would like to ask the last gentleman if we are to understand that if the rolling mill could roll a rail eighteen inches wide on the bottom, that he would consider it advisable. He says as wide as they can roll.

Mr. Clark.—Hardly.

President—Then you would wish to fix a limit to which you would go.

Mr. Clark—Yes, I should take brother Bishop's standard.

President—Six inches. We wish to discuss this question intelligently, and therefore to have you say what you mean.

Mr. Clark—I don't think they could roll over six inches and do it perfectly.

President—Mr. Stone, what have you to say with reference to the relative proportions of the rail as to height and breadth of base.

Mr. Stone—I believe, as Mr. Clark says and Mr. Bishop, it depends upon the weight of your sections as to the height and width of your base. All these rail makers claim that they cannot get the metal to flow out and obtain good results, on account of unevenness in cooling. I think that a rail in a 100 pound section should have six inches base and five inches height. I think five inches is high enough for any rail, and get as much as you can on the base, that is, I should think in the same proportion as Mr. Clark says. I think the ninety-five pound rail that we have is in good proportions. I find that, as regards our old rail of sixty pounds, and the seventy-two and ninety-five, that the sixty pound rail is nearer an even hardness all through the rail; our seventy-two pound rail, which is 4½ by 4½, we find, after it has had some wear, that the ball or head of the rail is soft, while the flanges are hard; and as to the ninety-five pound rail, I think that the hardness is about even all the way through. I think the wider you go with the flanges the harder you get them, and if it cools unevenly and quickly it makes bad line rail. I should say not beyond the limit they state, and the base a little wider than the height, if possible.

President—I would like to hear from Mr. Braley, of the Old Colony road.

Mr. Braley—I have nothing to say about it. I have no rail heavier than sixty-seven pounds to the yard, 4½ inches high, and my other is sixty. I think our folks are laying eighty pound rail between South Braintree and Boston.

President—Has any other member of the Association anything to say with reference to the height and breadth of base proportion? Will Mr. Post give us his opinion as to the relative proportions?

Mr. Post—Mr. President, I would have a rail wide enough to keep from rolling over; further than that I don't believe in putting any more iron in than is necessary. If a five inch base will stand up nicely and do the work of a six inch base, I don't see any reason for making them six, I don't see any reason for putting the money in it at all. I think a rail that is five inches high, and a five inch base, and possibly a quarter or half an inch more, will do just as well as a six, and save expense to the railroad. I don't believe in such a high rail or big rail, I don't think it is economy for the railroad to buy it at all.

President—If there is nothing further upon this proposition, we shall pass directly to the third proposition, which reads: "Should the same number of ties be used to the mile with the heavy rail as with the light." This is a matter that has been touched upon previously. I would like to hear from our Vice-President touching this point.

Mr. Lentell—Mr. President, I suppose that is more of a question for an engineer to decide, but I think the same number of ties should be used under a ninety pound rail as under a seventy-five or eighty pound rail. I think that five inches is high enough for any rail, and I am not sure but 4½ is high enough, but I believe in getting a wide base, 5½ inches at least, and 6 inches, if possible. I would like to see a rail—and I expect to see it some time— that will be rolled a half inch wider on the outside than it is on the inside. I think if we could get that and have a six inch base, we should not be required to use tie-plates. I think the rail would stand up all right of itself. But a 4½ rail —4½ high and 4½ base—will not stand up without some tie-plate or support under it. I think the ties under a ninety or ninety-five pound rail should be placed about two feet apart, or 2,600 to the mile, although in some cases I have them a little closer on our road. I don't think the cost of labor would be as much in taking care of a heavy rail section as of a lighter, with the ties the same distance apart; heavy rails stand up better, and will not require so much labor to keep them in place. In the winter time shimming will not require any more labor than it will on a lighter section.

President—Now, gentlemen, don't wait one for another. I would like to hear from each one. There are quite a number of roadmasters here whose names I do not know.

Mr. Stone—I don't think we should lessen the number of ties under a ninety-five pound rail. I think the ties are a part of the foundation of your track, and if you space them further or have less of them to the mile, or less to the rail, you weaken a part of the foundation of your track. It is just like building a house with a solid foundation, a very weak first story, and the upper story strong. I think the whole thing ought to be proportionately strong right through. I think that ties should be two feet on centres, eight inches face, seven inches thick, and eight feet long, and that they should not be spaced any further for a heavier rail.

President—Mr. McManama.

Mr. McManama—Mr. President, I think that the number of ties should not be decreased, but there should be the same number of ties under a heavy rail that are required under a lighter one. I believe in having ties enough under the rail to keep it up.

President—Will some one of these roadmasters off on this side give us their views? I can't call them by name. We would like to hear from them with regard to this point which is before the Association.

Mr. Post—I don't think that the number of ties should be decreased at all, because if you decrease the number of ties the rail would cut into the ties much more than it would if you had the full number. Consequently you are not economizing ties.

Mr. Clark—I don't believe we should decrease the number of ties, but I don't agree with Mr. Lentell in the number to the mile. I think it occurs to some of us that 2,400 are not enough.

Mr. Lentell—2,600.

Mr. Clark—2,600. I don't think that is enough. I don't think 3,000 are enough for some purposes. I have put in 3,200. With a six degree curve, and trains running forty-five to fifty miles an hour, I think the more ties you can get in the better, if you can make it solid underneath.

Mr. Lentell—I think that with trains running fifty miles an hour, with a six degree curve, they should be nearer than two feet apart.

Mr. Clark—That is something that you can see every week on the road that I am on. I will guarantee that there has not been a week this last year where they have not run from forty-five to fifty miles an hour on six degree curves.

Mr. Bishop—Mr. President, I believe in a good and sufficient number of ties. I don't believe it is necessary to get enough into the track to inconvenience ourselves in our work. Now I would space the ties so as to have uniform bearing under the rails. I like to see ties just as thick as they can be and be able to work with a shovel between them. I think that is thick enough. We all use about the same width of shovel. If we space off the ties so that we can dig easily between any two ties, it seems to answer the purpose and keeps the track in gauge and surface. I want to refer right here to one point—I don't know how it will come in here under those questions—we ought to impress railroad companies with the necessity of buying a good quality of rail. Mr. Stickney referred to this point a while ago. Now, I have had quite an experience in removing light rails to get them out of the way of heavy traffic. In 1875, I received a mile of John Brown Sheffield steel, and I think it weighed fifty-seven pounds to the yard. I laid it in near Fitchburg, when the Fitchburg railroad was a single track. It was doing the Fitchburg and Cheshire business at that time. It was a single track, I think, four or five years, and remained in five years after second track was laid. But the engines increased in weight, and the cars were heavier, and the loads were heavier, and we thought it advisable to take that steel out of there, and lay it on the Worcester division where we did not have so much business. So we replaced it with seventy-two pound rail. Soon after this fifty-seven pound rail was laid on the Worcester division, heavy engines began to run there, and we would see cars running over the track every day marked 60,000 pounds. That rail is on the Worcester division yet, and with the exception of the general wear it is just as good as it ever was. A good deal of that seventy-two pound rail is gone and some seventy-six pound with it. I removed about two weeks ago two miles of seventy-two pound rail that lay in the vicinity of that fifty-seven pound, and every joint was battered and bruised the whole length, and it looked more like a hay knife than anything else. That fifty-seven pound rail is in the track yet, with locomotives weighing ninety tons, and cars marked 60,000 pounds capacity, —and I guess they are loaded to their full capacity —passing over it. I think that we should not only lay a heavy rail, but one of better quality, and not advocate any light rail, because traffic will go sometimes where we think it is not going; and when you have got your light rails, as you think, out of the way, you will find they are right in the way, and they will have to be moved again, and it is an expense to be moving rails from one branch to another. I believe that we should have a large rail, and pay enough for that rail so that it will be first-class in every respect. I don't think there is any sense in laying a seventy-two pound and seventy-six pound rail on the Boston & Albany, or the Fitchburg, or the Boston & Maine, or any road doing a heavy business, and be obliged to take that rail up in five years, battered and bruised, so that it is good for nothing but scrap. I don't think there is any sense in that. If the company would go to the rail mill and get what they pay for, and pay, perhaps, more, I don't think there would be any occasion to entail that expense.

Mr. Drew—I am rather surprised to hear so many different opinions in regard to ties, the spacing of ties under the rail. In the country where I live the material is pine, of course, and we get a great many poor ties that don't face what they should. Consequently this last year, when I laid five miles and a half under the track, I put them eight inches apart. As brother Bishop says, I would like to get a shovel between them, but I can't do it. They were going to run heavy trains on this track this summer, and I thought that would cover the ground. If I were going to lay heavy rail I would not put them over ten inches apart. If a man wants to dress up his track occasionally, of course it is very handy to be able to get a shovel in between the ties. With the kind of ties I had this last year I put them eight inches apart. If I was going to lay seventy-five or eighty-five pound rail, I should put the ties as thick as I should with the lighter rail, and after you once surfaced that, if you had good ballast your track would stay there.

Mr. Lentell—Mr. President, I would like to ask what is the uniform custom, for instance, of putting sleepers on the different roads. I would like to hear from the New York, New Haven & Hartford.

Mr. Post—We put about 3,000 ties to the mile of single track, so that we think we can handle them nicely, and get a shovel in between the ties.

President—Any other gentleman from any other road ready to respond as to the number of ties per mile that you use. Mr. McManama, how many ties do you use to the mile?

Mr. McManama—About 3,000.

Mr. Stone—I would like to ask Mr. McManama how much face his ties are.

Mr. McManama—Well, they run from six inches to nine inches. It is pretty hard to get them all one width.

Mr. Clark—I think brother McManama will admit one thing, that if he could take hold of that road and straighten it out he could get along with less ties. I am troubled in the same way he is, have thirteen miles of curves on twenty-four miles of track. I could get along, if it were not for those curves, with less ties. I presume on the division that he has, or used to have—I don't know what he has now—but take the division from North Adams to Greenfield, which is very bad for curves, and sharp curves, too, I don't see how he could get along with less than he speaks of.

Mr. Shanks—I would like to ask the last gentleman if he would advocate a less number of ties on a straight line with this light rail than he has on some parts of his road.

Mr. Clark—I would not advocate any less, but I find that I cannot get along—cannot possibly get along with less than that on a sharp curve. I might possibly get along with less on a straight road.

Mr. McManama—I find the same as Mr. Clark says, that I can get along with less ties on a straight line than I can on curves. My track keeps up better on a straight line with less ties than it would on curves with the same number.

Mr. Drew—So far as keeping the surface is concerned, I should put the ties just as thick on a straight line as I should on a curve. Of course, if I had such curves as the brother speaks of—trains running fifty miles an hour on a six degree curve—I should put them in a little thicker. But near the Cape you have as hard work to keep up track on a straight line as on curves. There would not be so much trouble in spreading, of course, but so far as the surface is concerned I should want them just as thick upon a straight line as upon a curve.

Mr. McManama—On a curve, if all trains ran at the same rate of speed we could keep the surface just as well, but some passenger trains run quite fast, and freight trains run quite slow. On a curve most of the heft is on one rail, and it gets it out of surface very quickly, while on a straight line it would be equal.

Mr. Muzzey—In the discussion thus far nothing has been said about the tie-plates which we use under our ties. It seems to me that using the Servis tie-plate makes some difference as to the number of ties we need to use to the mile. That is, there will be an argument in favor of using less, because by using the Servis tie-plate we are able to hold the rail more readily, and therefore to diminish the number of ties slightly. Of course there must be a limit to the number of ties used. The more we get in the more we increase the labor in keeping up the track and increase the expense ; we increase the number of ties we have to take care of, and we increase the cost of material. The New York Central is said to use a very heavy rail section, a six inch rail on a rock ballast, and they propose two systems of spacing, of two feet and a half and three feet. They have tie-plates on, I think. With ties of eight inches face, with a heavy rail we could reduce the number of ties to the mile very slightly.

President—Is there anything further to be said upon the third proposition ? We have really opened up the fourth proposition, which reads, " Would there be a need of tie-plates with the heavy rail, owing to the wider base, to get full value from the ties ?" That has really been opened up—has any member anything further to offer ? We have one member of another committee present, and we don't want to let him escape until we get his report. Perhaps we had better suspend this discussion for the time being, so that we may get our committee reports in, and I would call upon the chairman of the committee of the following : " Is not the use of cheap and therefore inferior material and tools detrimental to the general economy of a road ?" Committee, Mr. Nevens, Mr. Bodwell and Mr. Merrill. I call upon Mr. Bodwell for a report.

Mr. Bodwell—So far as my report goes, I sent to the Secretary all that I had to say in regard to the matter, and he was going to follow it up and get a report from Mr. Nevens.

President—Then, we will simply have to drop that until our Secretary returns. We will continue the discussion of the fourth proposition which I have just read, "Would there be a need of tie-plates with the heavy rail, owing to the wider base, to get full value from the ties?" What is your opinion, Mr. Bodwell? Not having heard anything that has been said on the other propositions, perhaps you can give us a clear idea of this. Would you deem it necessary to use tie-plates with a heavy rail?

Mr. Bodwell—In regard to tie-plates, Mr. President, I would say that I think it makes a great difference what you use for ties. If I was going to use hard pine or chestnut, I don't think it would be necessary to use tie-plates, but on cedar ties I do think it would be necessary.

Mr. Clark—I would ask the last gentleman if a cedar tie cuts as bad as a chestnut.

Mr. Bodwell—Mr. President, I think it does.

Mr. Clark—Well, I will say that my experience has been just the reverse. I have taken out from one to four sets of chestnut ties in cutting out two of cedar.

Mr. Bodwell—Mr. President, I would like to ask the gentleman where those ties were situated, whether out on the main line where there were a few trains a day, or in the yard where they were continually pounding on them.

Mr. Clark—They were on the main line, where they ran from forty to fifty miles an hour, and from eighteen to twenty trains a day; the freight trains ran twenty miles, and the others thirty-five to forty. I can take you right to the spot at any time and show you the ties in the track. They were good, sound, solid white cedar, not any decayed cedar, not any swamp cedar. Our President knows the difference, of course, and so does almost every man here, between soft, decayed, dead cedar and the genuine live cedar. Every tie was solid. No ties that you could run your arm into, as you can into some other kinds.

Mr. Drew—As far as my experience goes with cedar ties I never have been troubled any more with cutting into them than into chestnut. The only question is, holding the spike running on a hard curve. On a sharp curve the cedar is not there. But as far as down on the Cape, in the country where I hold forth, is concerned, cedar ties outlast anything that we can get, spruce, or yellow pine, or whatever they are. Yellow pine ties split and crack. Chestnut cuts into. Well, we don't have but twenty-two or twenty-three trains a day, and a chestnut tie will cut in an inch and a half in two or three years, and then it is time to come out. When a spike begins to peep through the bottom, it don't hold much. Cedar is my favorite. The train rides more easily; there is more elasticity and more give. I have reference, Mr. President, to the down east cedar. I don't mean Dismal Swamp cedar of Virginia.

Mr. Bodwell—I would like to hear from the gentleman on hard pine ties.

Mr. Drew—Mr. President, I wouldn't have hard pine ties if they would give them to me. You have got to bore them. We have a great deal of trouble on bridges; we have to bore, and have the spikes pointed.

President—Mr. Mosher, of the Boston & Albany road.

Mr. Mosher—Our pine tie does not split particularly, and we have never had occasion to bore any of them. Hard pine of the stipulated length and of good size, don't split to any extent, and don't cut down.

President—I would like to ask, for the information of you all, as well as for myself, the last gentleman up, as I am aware that they use tie-plates on those ties with their wide base heavy rail—if he considers the expense sufficiently met by their use?

Mr. Mosher—Do you wish to know if we get additional life enough out of the tie?

President—Yes.

Mr. Mosher—I think so.

President—I would like to hear from Mr. McManama concerning cedar ties, and to ask him if there are any of those left in the track that were laid when he and I were pretty close together on the same road some years ago.

Mr. McManama—We had some of those cedar ties in up to last spring, when we changed them. They had been in then, those cedar ties, twelve or thirteen years.

President—Thirteen, I think.

Mr. McManama—Yes, thirteen. And we found they gave very good satisfaction. We used them on a straight line. Of course we used chestnut and white oak, too.

President—Just one question more: In regard to those ties, will you please state to the Association as to their quality in comparison with ordinary cedar ties—as I remember them, they were somewhat old and soggy, some of them—if those were as durable as the better quality.

Mr. McManama—Yes. sir. I found some of those when I was laying the second track, at that time. They seemed to be all decayed. I put in chestnut ties between, thinking that the track was liable to spread with the first train that went over. I found the chestnut ties had to be renewed twice, and I think the cedar looked better when we took them out than they did when we put them in.

President—What I wished to call forth, Mr. McManama, was that those ties, ordinarily considered, did not appear to me to be a choice lot of cedar ties, and I wanted to know whether the cedar was used or not.

Mr. Bodwell—As I understand the gentleman, those ties were put in to preserve the life of those cedar ties which lasted twelve years.

Mr. McManama—They were put in, but I found the cedar did not spread, and they looked just as well when taking them out as they did when putting them in. I didn't have much faith in them when I put them in, and so I put chestnut in between.

Mr. Clark—As I understand you, the chestnut cut faster than the cedar.

Mr. McManama—Yes.

Mr. Lentell—Mr. President, I never had much experience with cedar ties, though some seventeen or eighteen years ago we took out some cedar ties on the Boston &

Albany road that had been in twelve years. They were very large, and the outside seemed to be very much decayed, but the core seemed as solid as it ever was. It was a very elastic, of course, and easy riding track, and they were all on a straight line. In speaking of hard pine ties, I suppose they cost about double what a cedar costs. We don't use tie-plates on the hard pine ties, exclusively, we put them on chestnut as well. In fact, the first year we used hard pine ties we didn't use tie-plates. We have not had them in the track long enough to tell how they are going to wear, although I am a little doubtful whether they will wear as well as chestnut. I think tie-plates will prolong the life of a tie two or three years.

Mr. Braley—I have just fixed a track laid with cedar ties, very large, and many of them laid nineteen years.

Mr. Drew—Mr. President, I cannot speak from experience with regard to tie-plates. I always imagined that I should not like them, because I am not so fond of that kind of music and rattling, and never could see how they could be fastened so that they would not rattle in the track. I presume it can be done, but in order to have them lengthen the life of a tie there must be a pretty good surface to them. I don't know how much the tie-plates are—six by seven ?

Mr. Clark—Seven by nine.

Mr. Drew—If the base of the rail was five or six inches, I should risk that, and let the tie-plate go.

Mr. Lentell—Mr. President, you really get the same bearing as if your rail was nine inch base on the tie.

Mr. Stone—I made a mistake in the size of the tie-plate used on our road. I think it is six by nine for the five, and six by eight for the four and one-half.

President—Is there anything further ? We have not heard anything very definite yet from very many of the roadmasters as to the necessity or advisability of the tie-plate with a wide base rail.

Mr. Stone—We have had some experience with tie-plates on the Boston & Albany road with a four and one-half and five and one-half rail base. I think that on the four and one-half rail they would increase the life of a tie, say, two years, perhaps, and at the same time I think that they will give a better riding track. We have used the Servis tie-plate almost altogether, and have not found any trouble with rattling. I think you can keep your tie closer to the rail with the tie-plate. You get better service with the tie close to the rail, and that the tie-plate helps to make. But with the wider rail, say, five and one-half base, perhaps for economy in the life of a tie it would not pay to put on the tie-plate. I think that a tie will last a year or two longer with the five and one-half rail than it will with the four and one-half rail, under the same conditions. Another advantage of the tie-plate is you get rid of the scouring by the sand getting between the ties and the base of the rail, which causes ties to wear out rapidly. I think that by the use of this tie-plate, as I say, by keeping the tie tight to the rail, you can get better riding track, but as to the question of economy, I don't know whether it would pay with the wider base rail.

President—We will wait just a moment longer. It is very near the time that we have to adjourn on account of giving up this room that our banquet may be prepared here. Now, if there is anything further to be said by any one of you we don't want to choke off the discussion. I would ask our Secretary if he has the report as presented by Messrs. Nevens, Bodwell and Merrill.

Mr. French—It has not been returned from the chairman of the committee.

President—Have you any knowledge, Mr. Bodwell, as to whether Mr. Nevens will be here?

Mr. Bodwell—I have not, Mr. President.

President—Then without that we will simply have to postpone that matter for the time being, and perhaps take it up in the morning should we find Mr. Nevens here.

Mr. French—Before adjourning it would be well to have the members understand that Mr. Ellis has a very interesting paper on rail sections, and a very good display of the actual sections, besides many blue prints, and it will be a very entertaining paper, and come up the first thing in the morning. Now, regarding the dues of the Association. This room we propose to have vacant at five o'clock so that they can prepare for the banquet. We have got about ten minutes between now and that time, and if you will please step up and pay your dues for this year, it will accommodate me.

President—I want to say just a word in regard to this matter. The Secretary means everything all right, and it was very proper on his part to give you due notice that you are owing him something. Your President won't forget his part either, for he has not paid his dues. In regard to this paper which Mr. Ellis has prepared, I hope that you will all come together early so that we can have it the first thing in the morning, and see whether it shall explode any of our theories and present contrary opinions, after which I hope that we may have a few resolutions introduced for this Association to act upon. Remember that all hands are to be present to-night at 7.30, and until that time you will be at liberty to follow your own leadings. You will now adjourn until nine o'clock to-morrow morning.

### THE BANQUET.

The evening of the first day was set apart by the executive committee for the particularly social session of the convention.

Preparations had been made for a banquet at which the supply men should be the guests of the Association, and these preparations were excellently carried out.

At 7.45 o'clock the party of seventy-five people, consisting of ladies, representatives of supply firms and roadmasters, sat down to a well served banquet in the private dining hall of Cooley's Hotel. Mr. W. D. Otis, general roadmaster of the New York Central road was also present as a guest of the Association.

The dining room and tables were finely decorated with palms and flowers from the firm of Miller Brothers & Chapell.

After the dinner, toastmaster F. C. Clark, in behalf of the Association, presented a testimonial of esteem, in the shape of a handsome album containing photographs of the members, to Wm. F. Ellis, formerly engineer and roadmaster of the New York, Providence and Boston railroad, and for seven years Secretary of the Association.

Mr. Ellis responded very happily and gratefully.

Remarks were also made by several ex-presidents of the Association, including R. Hyland of the Cheshire road, G. W. Bishop of the Fitchburg road, W. E. Clark of the Vermont Valley road, and J. W. Shanks of the New London Northern road. Also several representatives of the supply firms were called upon.

G. L. R. French, who was re-elected secretary, said: "The presence of so many here this evening is indicative of the growing interest in our Association. In railroad circles it is rapidly becoming the recognized authority on those subjects coming within our jurisdiction. But if we should come together for the sole purpose of deliberating on such matters as pertain to our daily duties, I am afraid the interest would slacken and our membership decrease. We need a little diversion from our daily work, and I feel that a dinner like this is a departure in the right direction. We are pleased to have so many manufacturing concerns represented here to-night. We are much indebted to them for new ideas and new devices to aid in carrying on the work of our department in a safe and economical manner. I heartily wish success to you all."

F. C. Clark, the retiring president of the Association, closed the evening's entertainment with a few remarks. He said: "I want to thank you all for your presence and for what you have done to make this occasion a pleasant one. I am satisfied that this innovation is a wise one. We remember to-night that many of our former members have passed away. But we see here new faces and there are new names on our rolls of membership. They are mostly young men, men that keep pace with the times in railroad work and men that have new and practical ideas. We are indebted to them for many suggestions, and I have always made it a practice to give credit where credit is due. We have different opinions expressed in the discussions in these conventions, and they benefit us greatly. This free interchange of opinion is what we are looking for and what makes us honored among railroad men. I am glad to see the supply men here to-night. Ten years more of life added to this association will bring it to a higher standpoint than it holds even now."

## MORNING SESSION.

At 9 o'clock on Thursday morning, August 25th, the President called the Convention to order, and the proceedings were resumed as follows :

President—I want to say right here that we have a large amount of work to perform for this day. I leave you not later than 3.40 this afternoon, and I would like to accomplish as much as possible before I go. I thank you for your perfect decorum and for the kind assent which you gave to every ruling of the chair yesterday. We will now proceed with the discussion of the first question, which reads as follows : "Comparison of heavy rail sections with light : should there be an increase of labor to road-bed to get full life and value from use of the heavier rail ?" As I promised you last night, our member who was our first secretary has a paper to read upon this subject, and will do so now. I now call for the reading of the paper by Mr. Ellis.

Mr. Ellis—The paper that I have to read I will try to make as short as possible. We all know that in the past I have taken some notes on this rail question, and did at a previous meeting when you had the rail section itself up, show a rail that I put into use, and showed that there was nothing of the same kind then being used in this country. I shall refer to it in this paper ; the Forney modified. I know the criticisms which you at that time passed upon the same. In speaking on the rail section one has a great many things to contend with, and I brought these rail sections along to help out as well as I could (referring to a great number of half inch rail sections systematically arranged and fastened on a large board). As I say, I will make it as brief as I can.

Comparison of heavy rail sections now adopted for use with light rail sections. Should there be an increase of labor to roadbed to get full life and value from use of the heavy rail?

In making a comparison of the heavy and light rail sections in use to-day, there should be taken into consideration what parts of the rail, i. e., its head, web, and base are different in sections of the same weight, and why there should be such a difference, when it is admitted the demand exists for a rail section that gives the least deflection with such a head as to give a good bearing for support of the wheel, with least wear to head in its conflict with the wheel, a sufficient and strong base for its support and relieve wear to the tie and spikes that come in contact with same. As a help in this discussion I have brought a one-half inch thick section of most of the standard New England rail sections and some blue prints that I have prepared, pertinent to this question.

To within about fifteen years, light rail sections were in use of sixty pounds and less weight, with thick bases and webs; light heads of such hardness and toughness as to wear smoothly, even when a fish-plate was used as a joint, and very little permanent set when properly taken care of would be found. Similar to these sections; rails of 56 to 60 pound weight, 4 inches high by 4 inches or 3¾ inches base of John Brown, Landore Seimen, Barrow, Cammel and of American steel are in the track to-day, and in their favor a comparison can be made with heavier sections of more recent date, yet the day of 60 pound steel is of the past, for railroad companies through their increased traffic, requiring heavier rolling stock and rapid transit, demand of their engineers to design such rail sections as to meet the requirements of their roads, which, being of different character in different parts of the country, may account for such a difference in the heavy rail sections, and the personality of each road's section may be shown by my case, when a change was made from sixty to seventy-two pounds; the rail adopted was different from any other seventy-two pound section in this country. As each additional pound per yard means dollars per mile, it was aimed in changing from the light rails to get additional wear or life of rail as well as stiffness, and the additional weight was put mostly into the head and sections with round corners, and flaring sides came into use such as the Sayre pattern or modifications of same; of more recent date the American Society of Engineers pattern, having heads of less thickness, sharp corners with straight sides, thick bases with webs varying in thickness according to weight. Then the Dudley patterns, thin and wide heads, more radius at corner, slight flaring sides, thick bases with webs varying in thickness according to weight. I have made a table showing the width of base, height of each rail, thickness and width of head with corner and top radius, etc., of the heavy rail sections in use in New England. At the present time there being in use 67–70–72–74–75–76–78 and 95 pound rails, but will refer now to one of each pattern of the Sayre—Sayre modified,—American Society,—Forney modified and Dudley patterns. For Sayre pattern Boston & Maine 72 lb. Western Division, 5 inches base. $4\frac{1}{2}$ inches high, $1\frac{9}{16}$ inches head, $\frac{5}{8}$ inch radius at corner, 10 inches top radius, which with the flaring sides makes great friction on flange of wheel when in contact on curves, and with the width of head of $2\frac{5}{8}$ inches gives only $1\frac{1}{4}$ inches bearing for support and traction of the wheel, the thin edge of base is bad for wear of spikes. I will add that when you put the wheel upon same you have a bearing against the flange down on its side, which, of course, makes the most friction possible. For Sayre pattern modified—Boston & Albany 72 pound, $4\frac{1}{2}$ inches by $4\frac{1}{2}$ inches—$1\frac{3}{4}$ inches thick head, $\frac{1}{3}\frac{1}{2}$ inch corner radius,—11 inches top, which with light flare to sides, does not make great friction on flange of wheel when in contact—the base has round corner to ends to wear spikes—the $2\frac{3}{8}$ inches width of head gives a bearing of $1\frac{3}{4}$ inches, though other rail sections of somewhat similar design as regards thickness of head and shape, yet more weight, show a tendency of short life which I account for on account of such a large proportioned area being in the head. I will add that most of the roads in New England have followed this section to a great extent, putting the additional metal that they have put into the rail mostly into the head. And in my estimation, with the traffic that there is in New England to-day, they are not going to see the benefit of the money that they have put into that additional weight that they have added to the rail by putting it into the head.

For American Society Engineers pattern, Boston & Maine 75 pound, 5 inches by 5 inches—$1\frac{7}{16}$ inches thick head, $\frac{1}{2}$ inch corner radius, 12 inches top, straight sides gives the least friction to flange of wheels on curves and with its $2\frac{1}{2}$ inches width of head a 2 inch bearing for wheel and is adapted to roads with light curves, but on roads with numerous and sharp curves, when the gauge of wheels and wear of same is taken into consideration, objection is made to this ¼ inch corner radius, this rail has a good base for wear of spike.

For Dudley pattern, New York and New England 75 pound, 5 inches by 5 inches—1⅜ inches thick head, with 5/16 inch corner radius, 12 inches top, light flaring sides when contact with wheel is considered, is about same quality as last rail taken up on Boston & Maine 75, though has stronger base and proportional area of metal in head, base and web should give a good wearing rail head when compared with sixty pound rail sections of the past. The ½ inch fillet radius at top of web is not a help to the joint, now extensively used—the angle bar—when a comparison is made with the ¼ inch fillet of most of the rail sections in use. I would here say that angle bars after they have been put into use, have got to have their bolts screwed up, and to a certain extent the angle-bar has got to go towards the web member of the rail. I claim that when the angle-bar strikes the web member, or any part of the radius connecting that web member with the head or the base, it is detrimental to the joint; that as soon as there is any such contact there is a liability to have an action set in up and down, which means a wear of the angle-bar, and means then that as far as the angle-bar answering the purpose for which it was designed is concerned, it is of no account. An angle-bar that is worn, or is not tight to the rail through loose bolts, means weak and low joints.

For Forney modified pattern, Providence & Worcester (now Worcester Division, New York, New Haven & Hartford R. R.), 72 pound, 4¾ inches by 4¾ inches—1¾ inches thick head, ½ inch corner radius, 10 inches top, with sides sloping, 1/16 inch will not wear the fillet of wheel when in contact with same, and is adapted to roads with numerous curves; its 2⅜ inches wide head gives 1¼ inch bearing. The fishing angle, so called, is twenty degrees; most rail sections have thirteen to fourteen degrees, though the N. Y., N. H. & H. R. R 74 pound has 17 degrees, it being the purpose to reduce the amount of waste metal in head by this twenty degree angle. The base at ends of this rail is good for wear of spikes, but should advocate less thickness with more width of head and more thickness of base for heavy rail sections of this pattern.

The Master Car Builders have settled on a ⅝ inch radius for fillet of wheel, which comes in contact with corner of rail and on inspection of wheels, gauge of same shall be, minimum 4 feet 5 inches, maximum 4 feet $5\frac{3}{4}$ inches, and it is claimed that the $\frac{1}{8}$ inch outside crust of rail head, flange and tread of wheel is precious metal, which should be taken into consideration in comparison of rail sections, and you as roadmasters are interested in same. I would here state that I think those that have had thick heads in use will admit that after you wear off the outer crust of the head of rail, it goes very fast, and that is what I refer to as precious metal. The Master Car Builders, in settling on this five-eighths fillet, gave good reasons for same, and that they considered that the wheel will go very fast in its wear when that crust has been worn off an eighth of an inch.

A new car wheel placed upon and with fillet against corner of rail head of Boston & Maine 75 pound $\frac{1}{4}$ inch corner radius and Providence & Worcester 72 pound, $\frac{1}{2}$ inch corner radius, leaves a thickness of flanges of $1\frac{7}{16}$ inch or $1\frac{5}{16}$ inch respectively, and the two flanges on a curve would take from gauge 4 feet $8\frac{1}{2}$ inches, $2\frac{7}{8}$ inches or $2\frac{5}{8}$ inches, leaving for back of flanges as gauge of wheels, 4 feet $5\frac{5}{8}$ inches and 4 feet $5\frac{7}{8}$ inches respectively, which for maximum gauge, 4 feet $5\frac{3}{4}$ inches, may account for the sharp glisten and wear of the $\frac{1}{4}$ inch corner rail and the thrust of the wheel fillet against corner of rail head, which varies according to the degree of the curve, elevation, gauge of track and speed of trains, and whether passenger or freight trains are run on the same track, yet the rails will wear on the corner more or less quickly to about the form of the wheel, say $\frac{3}{8}$ inch radius. If that is admitted, rails with a $\frac{1}{4}$ inch corner radius have got to lose more precious metal or the wheel has, in their conflict, and this may account for such roads as the Penna.,—Baltimore & Ohio having $\frac{7}{16}$ inch corner radius, Philadelphia & Reading and Lehigh Valley having $\frac{1}{2}$ inch corner radius, and in New England the Old Colony,—New York, New Haven & Hartford,—Fitchburg $\frac{3}{8}$ inch, the Maine Central,—Concord & Montreal,—Housatonic and Conn. River, $\frac{7}{16}$ inch radius.

Yesterday in your discussion, one of the Boston & Maine roadmasters referred to their new seventy-five pound rail, that the metal was, he considered, poor in same. I have kept watch of that rail, and I can say that I found on the Saco River bridge, on a light curve, where there were new ties put under the rail when it was put in use—so that you cannot say that the tie had been cut by the rail—that in two months the metal on the head of the inside rail flowed in by the action of the wheel on the same. That indicated that the metal was soft. I might say, as the wheels had been running on a five-eighths Sayre pattern rail, the wheels had never been worn only in the same radius that they were originally made. So that there was a thrust against this quarter inch corner which had a tendency to flow that metal if it was soft. Compare the Boston & Albany ninety-five pound rail—which has the widest head in use, $2\frac{7}{8}$ inches, and the rail that they had in use, the seventy-two pound, $2\frac{5}{32}$ inches wide head together. I found when the ninety-five pound was put into use, the wheel had only a bearing to such an extent on the corner, that for about a quarter of an inch was the sharpest glisten. Then show a bearing in about $\frac{3}{4}$ inch. Then none, the rail looking a little rusty for $\frac{3}{4}$ inch. Then there was a bearing on the outside of the head. That meant that the engine wheels running upon that wide head did not get a good bearing, owing to having been worn by the head of the seventy-two pound rail. They immediately overhauled all the drivers of their engines and brought the wheels back to the form they are designed to have. I think that rail is a missionary to the Boston & Albany railroad. in obliging that company to put their engine drivers in the condition that every roadmaster present would like to see all the engine drivers on their road kept in.

To stop the slipping of the drivers of an engine in the starting and hauling of a train, and to allow more cars to be hauled to each train, stiff rails with wide heads are required, and if you look at wheels upon the sixty pound, the Boston & Maine seventy-two pound—the Boston & Albany ninety-five pound rail, will be noticed the superiority of the ninety-five pound rail.

To give stiffness to your rail, as in beams for bridge purposes, height is required ; as a comparison set against each other these four rail sections—the seventy-five pound Dudley type, Central Vermont, $4\frac{3}{4}$ inches base, 5 inches high ; Engineers type, Michigan Central, 5 inches base, 5 inches high ; Thick head type, Philadelphia & Reading, ninety pound, 5 inches base, 5 inches high ; Dudley type, Boston & Albany, ninety-five pound, $5\frac{1}{2}$ inches base, $5\frac{1}{32}$ inches high, practically same height, 5 inches, which indicates stiffness, but when a comparison of the width of head, width of base with its thickness, the seventy-five pound has $4\frac{3}{4}$ inches, the ninety-five pound has $5\frac{1}{2}$ inches base. All roadmasters would welcome the use of this heavy wide base ninety-five pound rail, with its proportional area and in a ride over the miles of same in the Boston & Albany tracks, the fact must come home to all that that road is the missionary to other roads in the good cause to settle the wide head theory, and that so wide and heavy a base can be rolled for economy of the rest of the section. I have here four pieces D Brand, Dudley type 65–70–80 and 100 pound rail, all with wide heads and great height; take of same the 100 pound, with 5¼ inches base, 6 inches high; compare same with the sixty pound rail of the past. Put them together and compare the heads. As I have no piece of the 100 pound Pennsylvania rail that is to be rolled, I have cut out a proposed section, which I believe is as intended; see same in the Railroad Gazette. Compare with that the 100 pound rail upon the New York Central, and note the dfference between the same sections of a 100 pound rail. When you look at the heads, one has a thick head and the other a thin; this question may be asked, which rail will have the metal annealed together when it is being rolled, so as to show at end of two years service no uneven surface in its head.

I will not weary you by taking up the proportional areas of the different rail sections to show the fact that there is waste metal in rail sections of the same weight, nor into the composition of the rail to have same hard and tough, knowing you will be satisfied if the heavier rail sections will wear as smoothly as the majority of the sixty pound rails have done in the past.

To get full life of these heavy rail sections, from my experience with same, you cannot take out of them, owing to their stiffness, light surface bends or remedy cripple joints as has been done with the light sections, and to insure to your railroad companies the net value and full life of these heavy rail sections, these questions can be asked:

Should not the foundation, i. e. good ballast, sufficient ditches, good ties for their support in winter and summer, be exacted?

Should not your ties be renewed early in the season and tamped correctly?

Should the weak place of the rails, their ends, be allowed to become low?

Should not the use of the adze, where high rails are in use, be used more than it is, on the ties of curves before their renewal in the spring, to keep those rails in correct position? As great damage can be done to the rail head where rail is allowed to cant and be worn by the wheel in such position, reducing the bearing for the wheel while in that condition, or when returned afterwards to its proper position, should not rails be laid in the track within at least one year of their rolling to get benefit of full weight? I have noticed where Bessemer steel rails have laid out of track for a long time, a waste of same from a scale of rust which does not appear when in use.

Should not more labor be applied early in the season before the hot months of summer, to the maintenance of the track? That is, instead of so many men per section for the year, the number to vary according to the season of the year when you as roadmasters can use that labor to the best advantage and for your company's pocket book.

[Table referred to in this paper is on following page.]

| | | | | HEAD. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TABLE REFERRED TO IN W. F. ELLIS' PAPER. | Weight. | Width of Base. | Height. | Thickness. | Width. | Corner Radius | Top Radius. | Straight Sides | Sides incline In. | Sides incline Out. | Fishing Angle | Fillet Radius. |
| | LB. | IN. | IN. | IN. | IN. | IN. | IN. | | IN. | IN. | DEG. | IN. |
| Maine Central | 67 | $4\frac{1}{2}$ | $4\frac{1}{2}$ | $1\frac{5}{8}$ | $2\frac{9}{32}$ | $\frac{7}{16}$ | 10 | .... | .... | $\frac{1}{16}$ | 13° | $\frac{1}{4}$ |
| Connecticut River | 70 | $4\frac{1}{2}$ | $4\frac{1}{2}$ | .... | .... | .... | .... | .... | .... | .... | ...... | .... |
| Housatonic | 70 | .... | .... | .... | .... | .... | .... | .... | .... | .... | ...... | .... |
| Concord & Montreal | 72 | 5 | $4\frac{1}{2}$ | $1\frac{39}{64}$ | $2\frac{9}{16}$ | .... | .... | .... | .... | $\frac{3}{32}$ | ...... | .... |
| Boston & Maine | 72 | 5 | $4\frac{1}{2}$ | $1\frac{9}{16}$ | $2\frac{5}{16}$ | $\frac{5}{8}$ | .... | .... | .... | $\frac{1}{8}$ | 11 | .... |
| Providence & Worcester | 72 | $4\frac{3}{4}$ | $4\frac{3}{4}$ | $1\frac{3}{4}$ | $2\frac{3}{8}$ | $\frac{1}{2}$ | 10 | .... | $\frac{1}{16}$ | .... | 20 | .... |
| New York, New Haven & Hartford | 74 | $4\frac{3}{4}$ | $4\frac{11}{16}$ | $1\frac{3}{4}$ | $2\frac{5}{16}$ | $\frac{3}{8}$ | 15 | .... | .... | $\frac{1}{16}$ | 17 | $\frac{5}{16}$ |
| Boston & Maine | 75 | 5 | 5 | $1\frac{7}{16}$ | $2\frac{1}{2}$ | $\frac{1}{4}$ | 12 | " | .... | .... | 11° 39′ | $\frac{1}{4}$ |
| New York and New England | 75 | 5 | 5 | $1\frac{13}{32}$ | $2\frac{1}{2}$ | $\frac{5}{16}$ | .... | .... | .... | $\frac{1}{16}$ | 14° 2′ | $\frac{1}{2}$ |
| Central Vermont | 75 | $4\frac{3}{4}$ | 5 | $1\frac{3}{4}$ | $2\frac{7}{16}$ | $\frac{1}{4}$ | 14 | .... | .... | $\frac{1}{16}$ | 4 to 1 | $\frac{1}{2}$ |
| Fitchburg | 76 | 5 | $4\frac{3}{4}$ | $1\frac{11}{16}$ | $2\frac{1}{4}$ | $\frac{3}{8}$ | flat | .... | .... | $\frac{1}{8}$ | 14° 30′ | $\frac{5}{16}$ |
| Old Colony | 78 | 5 | $4\frac{3}{4}$ | $1\frac{3}{4}$ | $2\frac{5}{16}$ | $\frac{7}{16}$ | 11 | .... | .... | $\frac{1}{16}$ | 14 | $\frac{7}{16}$ |
| New York, Providence & Boston | 78 | 5 | $4\frac{23}{32}$ | $1\frac{21}{32}$ | $2\frac{7}{16}$ | $\frac{3}{8}$ | 12 | " | .... | .... | 14 | $\frac{7}{16}$ |
| Boston & Albany | 95 | $5\frac{1}{2}$ | $5\frac{1}{32}$ | $1\frac{9}{16}$ | $2\frac{27}{32}$ | $\frac{5}{16}$ | 14 | .... | .... | $\frac{1}{16}$ | 4 to 1 | $\frac{5}{8}$ |

President—Gentlemen, what is your pleasure with reference to the interesting paper we have just listened to?

Mr. French--Mr. President, I move that we give a vote of thanks to Mr. Ellis for this splendid paper, and that it be published in our annual proceedings.

The motion was duly seconded and carried unanimously.

President—I wish to say, for the benefit of those present who were not here yesterday, that the question under discussion was supplemented by questions presented by the committee, reading as follows: "First: What should be the maximum weight of rail to the yard? Second: What proportion should the base of the rail be to the head? Third: Should the same number of ties be used to the mile with the heavy rail as with the light? Fourth: Would there be a need of tie-plates with the heavy rail, owing to the wide base, to get full value from the ties?" Our discussion was somewhat extended yesterday, and the shortness of time which we have to devote to the work, will preclude our taking up this discussion further at the present time, as I view it. I deem it wise to appoint a committee on resolutions for each of these questions. I don't mean for each of these supplemental questions, but for each committees' report. I would therefore appoint for the committee on the questions that we have just discussed, your newly elected President and our Secretary. For the committee on the next question, lest I should forget it when the time arrives, I will give you the two committees now. I will appoint Mr. Mosher of the Boston & Albany road, and Mr. Stickney. I make this mention now so that they may pay particular attention to the discussion of the second question, which reads as follows: "Small culverts and cross drains: best material and form for same." We have quite a number of supplemental questions here, and I do not know whether we will have time to take them all up separately. You can cover the ground as you see fit, and I hope that we shall have no time run to waste. If I do not call upon the proper party I want the proper party to get up without being called. We want to hear from you all and get your ideas. I would call upon Mr. Patch of the Connecticut River road.

Mr. Patch—Mr. President, I would rather be excused and let some one else open the discussion, and I may say a few words later on.

Mr. Clark—Mr. President, I will give you my practice, although it may be very poor. For all culverts up to four feet in width I lay a stone which reaches clear across to the side walls. I don't build a culvert that a man cannot get through comfortably; generally two feet wide and four feet high, nothing less than four feet, if there is room; if there is not head room, of course, I do. I cover with flat granite stone, don't arch, but cover; everything up to four or even eight we have coverings for. I have one water way that is ten feet and covered with flat granite, with about eighteen inches or two feet of gravel on top of it. It has been in that condition some six or eight years, and we have not taken up our covering stone yet. The covering stones are from two feet to 30 inches in depth. I believe in having your bottom solid stones, reaching under both walls, and a flat stone covering. Anything that you can't get stones large enough to cover the top you can arch, of course. I don't favor an opening of any kind, in the road. I think we can avoid most of them by using covering stones. Take our ordinary bridges, from fifteen to twenty-four feet in width, I should favor covering those and putting the ties right in on solid bottom, so that there would not be any work for the carpenters, or any ties to bunch up in case of derailment, or any holes for wheels to drop into. I think it is the proper way to construct all openings of that kind.

Mr. Brennan—My idea of constructing culverts and water ways is very similar to Mr. Clark's. I cover them with stone where they are not too wide, and for anything over eight feet I use rails, good rails long enough to reach across, and cover over solid with old rails. I lay the walls up in cement, and pave the bottoms, and cover them all up with dirt. I consider that we can get the best results from doing work in that way.

President—Mr. Drew, have you anything to say upon this subject ?

Mr. Drew—Mr. President, I don't have a great many culverts upon my line, but I don't think that if I had any ten foot openings I should put coverings on. The shock of a train going fifty miles an hour I should say would break them, even if they were over thirty inches. I have had three or four cases covered with stone, about four foot openings, with the covering stone twenty-five inches, and I have got three or four now that are broken. It don't seem possible that you could put on a covering stone with a ten foot opening, that the jar and momentum of a train would not crack, that is, covering stone two feet or two and one-half in thickness. As for covering them if they were six or eight or ten feet, I should say they ought to be arched. Of course, I should lay them with rubble and cement, and all those things, and if you are going to avoid having an opening in the track I should say arch them beyond a six or seven feet opening.

Mr. Clark—I will agree with Mr. Drew on that point, if you can't get a covering stone sufficiently strong to hold them up. In this case they have proved strong enough so far.

Mr. Brennan—There is another point to be brought out here, gentlemen. Take culverts that you have not got a chance to get a good arch over, I would put a stone over, as I say, on narrow culverts, and rails over those that were wider. The reason that I put rails in is because there is not room to put in stone without interfering with the track and allowing water to go through.

President—Are you ready, Mr. Patch, to give us your idea ?

Mr. Patch—Not just yet.

President—Mr. Post, of the New York, New Haven & Hartford.

Mr. Post—Mr. President, our culverts, many of them, were built years ago, and they were put in with covering stone, thick and solid, and they hold up in good shape.

But lately we have built the sides of good brown stone, and arched everything over with brick in a substantial manner. Our cattle-guards are open, of solid stone work. I rather like to see everything covered in, if possible, as brother Clark has said.

President—Mr. Greer, have you an idea for us in regard to this question ?

Mr. Greer—I would like to know from Mr. Clark how he prevents his culverts from being undermined, either arched or open. That is one of the supplemental questions, as I understand ; best method of protecting ends of culverts from undermining and to prevent water from getting behind the wall.

Mr. Clark—In this case that I speak of, by flagging with large sheets of granite, and letting them slant down on an incline. Here the water on getting through strikes into deep water. Other places are paved. It depends upon the place a great deal. That is a very important part, of course, in all culverts, and it is the weak part, generally, disposing of the water after it goes through.

President—We have with us this morning from the New York Central road, Mr. Otis, General Roadmaster of that large road, We would be glad to have a statement of his method, and his opinion in regard to this question, if he will favor us.

Mr. Otis—I find in my experience in building culverts we use a great deal of iron pipe instead of stone. The roughness of the stone sides, and of the bottom, especially, checks the leaves, and bushes, and small sticks and other larger stuff, which fills it up. The pipe is laid at a good incline to the road. With a smooth surface, and narrowed sufficiently, it drives the water and everything else forward and carries it out on the other side. We have been having better success with them than anything we have tried. In regard to covering culverts, we use a great deal of rail. We are not in a country where we can get good strong granite, and we use good rail. But in all culverts up to four feet we are having better success with the pipe than anything we have tried. If we have a stone culvert we should have a smooth bottom and as smooth side as we can get.

Mr. Lentell—Mr. President, I don't think there is any question, if we have sufficient depth, but what a covered culvert is best. But I suppose what is sought to be brought out here concerns culverts that are not deep enough to be covered ; that is to say, to get covering stone down low enough to clear the tie and give sufficient ballast between the tie and covering. The Boston & Albany this year—this year for the first, I think—are putting in iron pipe for all shallow culverts. If they can't get a pipe large enough to carry the amount of water that the culvert should carry, they put in two side by side, and in no case is there to be less than a foot of gravel between the top of the pipe and the ties. I think it is going to be a good arrangement, but of course we cannot very well say until we have tried it.

Mr. Stickney—I would like to ask Mr. Otis up to what size he would use the iron pipe.

President—Up to four feet, he said before.

Mr. Drew—Mr. President, I would say that down on the division where I am, on the Old Colony, we are adopting that plan of putting in iron pipe, and if one will not carry the water we put in two, laid under three to ten or fifteen or twenty feet of bank, in two feet of rubble, and don't anticipate that we will have any trouble, or that it will have to be repaired during our day. Our iron pipe are one and one-quarter inches thick, and our folks buy condemned pipe, which is just as good as the perfect, and will probably last as long. We don't consider that we shall have to look after it in our time, after the pipe is once in.

Mr. Patch—Mr. President, I would recommend that all culverts less than three feet be of cast iron pipe. We have a number of those in the road, and they give us good satisfaction. For any culvert larger than three feet, where a three foot pipe would not take the water, I should put in a stone culvert. I would have flagging on the bottom, with the joints well grouted, and I would have the side walls laid up dry and grouted. Then I would cover it with granite flagging. If I had a culvert that was over five feet wide, instead of making it any wider, I would put in a double culvert. I would put in two, with a pier in the centre, and then let my flagging reach from one side wall to the pier and from the other side wall to the pier. I wouldn't recommend, nor I wouldn't use, any open culvert, if I could possibly avoid it. But if I was in a place where I hadn't got depth enough, I should use for stringers across an open culvert I-beams. Then I would place my ties across the same as I do on our bridges, eight inches apart. I would not recommend an open culvert, if it could be avoided.

President—Mr. Mosher.

Mr. Mosher—Mr. President, Mr. Patch has taken all the wind out of my sails, I haven't anything to say.

President—We have with us this morning one whom we gladly welcome, who has been with us quite a number of years, and being connected with furnishing supplies, to a certain extent, is, I suppose and hope, making lots of money. I would ask for some remarks from John Lane, ex-roadmaster of the New York, New Haven & Hartford road.

Mr. Lane—Mr. President, I can truthfully say that I am glad to be able to meet with you once more, if not as a roadmaster, to greet you, and look you all in the eye; but as for any remarks on the questions named, I must say —well, as the boys say, I am not in it. I have about all I can attend to in my line of business, and therefore practical railroad affairs have rather dropped out of interest with me. As I said, I am very thankful to meet you all, but think you must excuse me from making any remarks.

President—I would say to the roadmasters—not in the line of criticism because of the direction or tendency of the discussion—the question simply takes cognizance of small culverts and cross drains. Of course there is not a limit fixed in this, and what would be considered a small culvert might be a debatable point. Now, the question for you to consider, within the meaning of this term, "small culverts," is, as to what you would use, that is, the best material and form for the same. You have proceeded well in the discussion thus far, and I only call your attention to this fact, as there might be a tendency to reach out after what we ordinarily consider large culverts. It is well for members always to confine themselves as closely as they can to the main question. Mr. Hyland of the Fitchburg road.

Mr. Hyland—Mr. President, I don't know as I can add a great deal to what the gentlemen have already said upon this culvert question. The culverts on the division that I am on are built of granite, and up to three feet wide and three feet high they are covered with stone. We have one, I think, that is four feet, a double culvert, a double box culvert. Those larger than that are all arched over with stone or brick. We have a few open culverts that are built with stone sides, and we use rails for covering those. I am putting in this year some iron pipe in some of the open culverts, and expect to have good success with it.

Mr. Bishop—Mr. President, when you called upon me a short time ago I thought I would not say anything on culverts; but this iron pipe scheme has presented itself, and I wish to say that I am heartily in favor of the use of iron pipe. On the Fitchburg road for several years we have relaid old drains and put in new drains with iron pipe anywhere from twelve inches to three feet. I have it on my division from twelve inches to three feet in diameter, and it has certainly been a success. As Mr. Otis remarked, it is smooth on the surface, and when you look through those culverts they are always clean, you don't find any bushes, or sticks, or leaves, hung up inside to clean out. I have filled up several small passes and high culverts this year, after laying in pipe, and giving it a good pitch. I am heartily in favor of iron pipe for anything I should consider a small culvert. Any culvert that it is necessary to have open, I cover with iron rails or I-beams, and place the ties close together, so that if a wheel should get derailed it would be possible to pass over and not bunch up or drop through.

Mr. Clark—Pardon me once more, if you please. Speaking of iron pipes, I will relate a little experience I had last year, it may help some brother roadmaster out who is in the same condition. We had a fill of about thirty feet, and on the back or upper side of that fill it always filled in with water, and there was no water way through it at all. In order to get through that, Mr. Mulligan bought some wrought iron pipe, twenty-four inches in diameter. I first made a buttress of wood on the upper side, dug in as far as I could conveniently, and placed one length of this pipe in the opening that I had dug into the side of the bank; I then put hydraulic jacks behind it, and pushed it through this embankment of thirty feet under that track, without disturbing the track in any manner. After I had pushed the first length in, I joined on the second length, and kept my hydraulics at work behind, and kept crowding it through. In the end I had about fifty feet of pipe—about that, fifty-nine I think, over fifty—in place. As we crowded it in I had a man go in and dig out the dirt, and pull it out. And it has been one of the most satisfactory jobs that I ever did of the kind. It cost us but little, it did not disturb the track in any manner, and it was successful in every way.

President—I presume it might be a source of satisfaction to you all, and aid you somewhat in this discussion, for us to have a statement—I don't mean a complete statement, Mr. Otis—but a simple statement, or rather a statement of the cost of a three foot iron pipe in comparison with the cost of a stone culvert that would carry at all times the same amount of water that would pass through the iron pipe; which costs the most?

Mr. Otis—I should say, Mr. President, at a rough calculation, that the iron pipe is much the cheapest, although I could not answer that correctly without referring to the books in the office. But there is quite a difference in the cost, the iron pipe is much cheaper.

President—I would ask any roadmaster present who has any knowledge of this iron pipe, if he can give us a comparative statement. I don't mean in dollars and cents, but from your experience and from your practice in working, you may be able to judge and say how they compare.

Mr. Patch—Mr. President, I will say that where you have got to build over an old culvert, and make a new culvert, if you have got an old culvert, a culvert that is past repair, and it has got to be built over, the cost of a new culvert of the same dimensions as the iron pipe is just about equal. We have built over within two years four, where we have put in thirty-six inch iron pipe, and our engineer, Mr. Harris, says that there would be no difference in the cost, or not enough to make it any object, between the stone or the iron pipe.

President—Any other roadmaster here anything in addition to state in regard to this matter.

Mr. Drew—Mr. President, I cannot exactly agree with brother Patch. It would depend upon circumstances. Down in the section of the country where I live we have to pay out five or six dollars a yard for ordinary stone work ; but if you have got to crib, and go to all that trouble, I think the iron pipe costs a little the most. That is to say, two foot iron pipe will take about the same water that a three foot square stone culvert will—well, there is not much difference, because there is not as much friction with the iron pipe as there is to the square stone one. On the average, perhaps iron pipe would not cost much more, unless you bought first class. We buy from the Gloucester works at Philadelphia, and I have laid seven or eight within a year. We get considerable discount. The last one I put in was 250 or 300 feet long, and the pipe cost $675. I don't think I could have put in a stone culvert there for that price, a thirty-five foot fill.

President—Has any other roadmaster anything to offer on these questions ?

Mr. Patch—Mr. President, I have not heard anything said yet, I believe, on cross drains. I understand that is one of the questions there. I would recommend for cross drains chestnut plank boxed. I would have them left open, so that if they freeze up they can be picked out again. And on curves I would put them in as often as once in 400 feet. On straight lines we don't put in any anyway, we calculate the gravel is good enough to soak up the water. On curves we put them in once in about 400 feet, using two inch chestnut plank, and making a twelve inch box.

President—Any further remarks upon this point ?

Mr. Drew—Mr. President, I would ask brother Patch what would be the objection to a small iron pipe, if there was depth enough to put it in, instead of plank ? Then there would be no opening in the track.

Mr. Patch—I would answer that in this way : Unless you can put in a small iron pipe down where it would not freeze, in the spring of the year it is thawing, and that pipe will be running full of water, it will come on cold, and it will freeze up solid, and then you have got no drain at all. If you have an open plank drain, you can send your man there with a pick and shovel, and in about twenty minutes he can pick it out, and you have got an open drain again. I have had in pipe as he speaks of, and I have had to take an engine, with a hose pipe, and go and thaw that with steam for sixty feet, following the hose in as fast as it thawed, until I got a stream of water running through, and then it would clear itself in a little while.

President—Anything further to be said ? If not, I shall very soon turn this matter over into the hands of the committee on resolutions, as we have got another question ahead of us that will require perhaps a little time for presentation, and then after this comes from the committee's hands perhaps it will come in the form of a resolution so that it will bring some of you on to your feet again. I hope the committee won't find it necessary to be gone from the room any longer than can be avoided. The next question that is coming up is one in which I think you are all somewhat interested, the question of fire damage.

## FIRE DAMAGE.

President—The next question reads as follows: "Fire damage: how to lessen the number of fires, and best method of adjusting claims." The matter had been presented to me, and my opinion had been asked by several of the roadmasters as to the advisability of taking this question up, and though I am subject to the wish and will of the members of the Association fully, I am for myself willing to stand by my opinion; in other words, I think roadmasters should possess the courage of their own convictions. I will read you the report of the committee, as our Secretary is absent. [Reads the report.] I would call upon Mr. Bodwell to open up this question, I notice he is on his feet.

Mr. Bodwell—Mr. President, I don't know as I have anything to say in regard to that, as I have not had any experience to speak of with fires; I am not in a fire territory.

Mr. Patch—Mr. President, I move that we accept that report without discussion.

Mr. Clark—I second the motion.

The motion was put and carried.

President—There is another report that has not been presented as yet to the convention. "Is not the use of cheap and therefore inferior material and tools detrimental to the general economy of a road?"

Mr. Patch—Mr. President, if I am not out of order, I would like to say just one word to the chair and to the members here. Last evening I gave through Mr. Sampson, an invitation for the members and their families, and also the supply men, to an excursion up the Connecticut River valley as far as Greenfield and return, by a special train. Now, if they are going to accept that invitation, our superintendent would like to know it, in order that he may make the necessary arrangements for the same.

President—Gentlemen, what is your pleasure in regard to this invitation? I await any action which you may see fit to take by motion or otherwise.

Mr. Lentell—Mr. President, I think it would be well to find out how many there are here who can go, or would like to go, as a starting point.

President--In order to arrive at that matter, perhaps I would be as chairman assuming very much, but I would simply ask as a favor that each roadmaster now present in the room or any of the supply men who are present, who can accept the invitation and would be pleased to, to simply lift the right hand. [With one or two exceptions all present responded in the manner requested.] A very good showing. Well, then it is eminently proper for you to make a motion.

Mr. Lentell—Mr. President, I would like to ask how long a time this trip will take, and about what time we could get back.

Mr. Patch—It would take about three hours, thirty-six miles up and thirty-six back.

Mr. Lentell—I should like to go on that trip, but it is almost impossible for me to go ; I am obliged to be in Boston at six o'clock to-night.

Mr. Paxson—I would like to inquire, Mr. President, about what time we should be able to start.

Mr. Drew—Mr. President, I would like to ask whether going on this excursion would interfere with the business of this meeting. We are all for business first, and then pleasure afterwards. If it is going to interfere with the business of this meeting, can we do the work ?

Mr. Shanks—Mr. President, I am always in for a little fun when they introduce any. It strikes me that we can do all the business up between now and four o'clock, and there will be ample time after that to make this trip. If I am not mistaken, the President announced once before that he had got to leave at a certain time this afternoon ; I think if we could rope him into this trip up the road, that he could not get away so quickly. It strikes me that we can do considerable business between now and four o'clock, and then take the excursion.

President—There are three questions now presented: first, as to the time when this trip shall be taken ; second, as to whether it would interfere with the business of the Association : the third and last, though hardly to be considered as a question, had special reference to roping in the President of the Association. It is barely possible that twelve men later on may have something to say about whether your President shall be roped in or roped up where he has nothing to stand upon, but so far as that is concerned, I would say here that it is entirely out of the question for me to go, it is absolutely impossible, as I have promised and have an important business engagement that requires my presence in Bridgeport. I would like very much to go with you, and would simply suggest to you that as many of you as can take this in will find it very pleasant. I have been twice during the past few months up that same road and back, and you would enjoy it very much. I simply would advise all to go who can, provided there is a motion that comes before the house that we can entertain properly. As yet there is nothing.

Mr. Patch—Mr. President, I want to say just one word more, just the same as though it was any other road that had extended this invitation. I would like very much to have you go upon this excursion. I would like to have every member, and their families, and all the supply men, go. If you go, I want to have enough so as we can make a little show by going. I want every man to go, the President, Secretary, the Executive Committee, and all hands. I think you can afford the time and start home to-morrow. I do not believe that any of you have left as important a job as I have in Greenfield, that ought to have my attention there. I shall go up with you to Greenfield, and stay there, but you will get home all right I will guarantee.

President—Do you desire to take any definite action in this matter ? I await a motion.

Mr. Drew—Perhaps it will be best to gratify brother Patch. I suppose he has got everything all worked up, has been thinking about it for three months, and will be disappointed if you do not go. It would perhaps do him a great deal of good. Perhaps we had better go—if we can do it without interfering with our business here, I mean.

Mr. Shanks—Mr. President, I move you that we do accept the invitation, and that we arrange our business so as to close at 4 o'clock, and take this excursion.

The motion was duly seconded and carried.

President—It is a vote, and the invitation is gratefully accepted, brother Patch. I would say here that it is the opinion of your chairman that the time and place of our next meeting should be attended to pretty soon, and I would suggest, if there is no objection, that we attend to that matter just before we take our recess for dinner today, as immediately after dinner we would like the presentation of the resolutions touching the questions that we have been discussing. Our time is short, and our Secretary is anxious for material to fill up our published report. We all want it, it is advisable. I would ask if Mr. Bodwell is in the room. He does not seem to be present. Whilst waiting for Mr. Bodwell's report, is there any objection to our taking up the matter of the time and place of our next meeting ?

Mr. Clark—Mr. President, as we do not hear any objection, I move that Boston be the place of our next annual meeting, the exact location in Boston to be left to the Executive Committee.

Motion seconded by Mr. Drew and carried.

President—As to the time of our next meeting.

Mr. Clark—Mr. President, as I understand it, our by-laws and constitution cover that ground. Possibly I am mistaken.

President—I think you are mistaken, unless there has been some amendment that is not down in our constitution and by-laws. The third section of Article III says that the place of the next annual meeting shall be decided by vote of members present, or by the Executive Committee, of which all members shall receive due notice. That refers to the place. The section then reads: Regular annual meetings of the Association shall be held at some place in the New England States on blank, leaving the time to be selected at our annual session, and you must remember that we have changed our date. Unless there is some by-law that is not on this, that has been adopted by the Association—and I don't remember that there is—there is no specified time.

Mr. Clark—I would make a motion that we meet the third Wednesday in August, at half past one.

The motion was duly seconded.

President—There has been some expression of opinion in regard to the advisability of meeting in August or some other time. I only mention this, not to discuss it at all, but that you may have due notice. The motion is made and seconded that we meet in Boston, at the place selected by the Executive Committee, the third Wednesday in August, at 1.30 P. M. Will you remark upon this motion? There is an opportunity for you now to present your views.

Mr. Paxson—If it is in order, I would suggest the month of October, the time in the month to be fixed by the Executive Committee.

Mr. Brennan—I would prefer October, Mr. President.

Mr. Lentell—Mr. President, it seems to me that October is a little late. I may be mistaken, but I believe that the National Convention comes in October, about the first of October, and a great many members, or some of the members, would probably like to attend that. It would certainly be more comfortable, especially in the city of Boston, in October, than it would be in August. I should suggest about the first of September.

Mr. Clark—Mr. President, I think this matter has been discussed at our former meetings. Our Vice-President and newly elected President suggests the first of the month. That is a bad time for the roadmasters to get away. We have our reports to make at that time. The thing has been very thoroughly discussed years ago, and for my part it does not make any difference whether it is October or

September, but I think the general expression has been in the years gone by that about from the middle to the 25th of August was the best time for us to meet as roadmasters. However, I abide by the decision of the majority.

Mr. Lentell—When I said the first of the month, I did not mean the first day of the month, or perhaps the first week in the month. This is only my opinion. Of course I agree with the majority of the brothers.

Mr. Shanks—Mr. President, as long ago as when the organization first started. I think that we met in the month of October, and the question arose then, whether it would not be advisable to change to an earlier date, for the fact came up that on many of our northern roads, our roadmasters were very much taken up with preparing for winter. Winter sets in pretty early in the northern part of this country, and it was found advisable to change on that account. It seems to me that I should not be in favor of going back to the month of October. If we can get off any time in the year better than another, it seems to me that that time is at the season when we are holding our conventions now, in August. It is a time when we can be better spared from our work, and I would suggest that August be the month.

Mr. Hyland—I think the strongest argument in favor of changing to August was because the festive clam was then in season, and that was a great inducement for our northern friends to come together, so that they could go to Boston and get a shore dinner. It is a great inducement, and I should be in favor of keeping it in August.

President—I would say for your benefit, Mr. Secretary, you having been out of the room, that for want of some of the committee men's presence, we have taken up the matter of the time and place of our next meeting, and have voted to hold our next meeting in Boston. A motion has been made and seconded that the time shall be the third Wednesday in August. I will say for your benefit that that will be the motion that will have to be presented to the body. It is proper, and in accordance with good usage, or, if you please, parliamentary law, for an amendment to be made, and the vote would have to be taken upon the amendment first. Those who believe that August is not the month, of course understand readily when to vote. If there is nothing further, I shall proceed to take a vote. Are you ready for the question ? As many of you as favor the holding of our next annual session on the third Wednesday in August, at 1.30 P. M., will signify it by saying "Aye."

The motion was carried, without any dissenting votes.

Mr. Patch—I would like to know about the arrangements for this excursion. I would like to have you state if you can, about what time we could get away. It would be well if you could get away between three and four o'clock. We would like to get the train ahead of our four o'clock train, out of here. There are a number going north, who claim they must go home to-night. If you can get ahead of that train, they might go with us as far as Greenfield, and then take the regular train home.

President—I would like to ask Mr. Patch how 3.40 would do, if that would be amply sufficient ?

Mr. Patch—I think it would. If we leave here at 3.40, we should follow our Montreal express, and we should get in here at 6.15.

President—Are you satisfied, or do you desire any further information as to the probable number who will go ? Are you satisfied upon that point ?

Mr. Patch—I want them all to go, every one. Of course I would like to know about how many, so that we can make arrangements.

A rising vote of the number going was taken, and all rose with the exception of two.

Mr. Patch—I would like to say one word more. About how many ladies are there that will go, do you think ?

President—You will have to ask some of the supply men, I could not tell you.

Mr. Davidson—I would like to say, on behalf of the supply men, that there are about eight ladies here, and I suppose they will all go.

President—We will now call for the committee's report on the fourth question: "Is not the use of cheap and therefore inferior material and tools detrimental to the general economy of a road?" Mr. Secretary, please read the report.

Mr. French—This is submitted by only one of the committee, Mr. Bodwell, and reads as follows:

In regard to the question: "Is not the use of cheap and therefore inferior material and tools detrimental to the general economy of a road;" the members of this committee having failed to meet together, I submit the following as my part of the report: I think that cheap material is the most expensive when labor of renewal is considered; inferior material will last only a short time, so that saving on first cost is lost on labor required for frequent renewals.

The committee were requested to submit a few questions and I submit the following:

1. In using steel rails, is it not best to use steel track spikes?
2. Is it not a saving to pave all crossings and put T rail in instead of street rail at public crossings?
3. Does not a good cedar tie make the best riding track?
4. Which is the easiest taken care of, a point or a Tyler switch?
5. What is the best switch frame to use, positive or automatic?
6. Why should not rails be increased in weight as weight of engines and cars is increased?
7. Is the bolted frog with a steel plate six inches by one inch under the point of frog, the best to use?
8. What number of frog is best to use at junctions?
9. Should iron or steel bolts be used at track joints?

S. B. Bodwell, B. & M. R. R.

On motion of Mr. Lentell, duly seconded, the report was accepted and laid on the table for future discussion.

President—There are many points presented in these questions, which have been virtually covered—though not known, of course, to the committee when it drafted these—by previous discussions. There are a number of points that have not been presented, and the fourth supplemental question brings forward one : "Which is the easiest taken care of, the point switch or a Tyler switch ?

Mr. Hyland—I think the Tyler switch is the easiest taken care of. It would be for me, for I should take it out and throw it away.

President—Any further remarks upon that question.

Mr. Shanks—I thing there is no question about this matter, but that all will admit that the point switch is the easiest to take care of in the track. I agree with the last speaker that the Tyler switch should be taken out of the track and laid to one side, so that it would be left out of the discussion.

President—Anything further to be said upon this point ? It is a good deal like cleaning up our sections, we want to get rid of all superfluous material. I therefore give you the points. The supplementary question number five is, "What is the best switch frame to use, positive or automatic throw ?" Mr. Greer.

Mr. Greer—Mr. President, I don't know anything about the positive throw, but an automatic is good enough for me.

Mr. Lentell—It seems to me that that is decided altogether by the kind of switch you use. If you use an automatic switch you have got to use an automatic stand.

Mr. Shanks—Mr. President, I think, if my recollection is correct, there are some roads, even here in New England, where the art of caring for track is probably carried to as near perfection as in any other section of the country, where they do use a stand that is not automatic on point switches. I don't think I would do it ; I think the automatic switch frame is the best known at the present time to be used with a point switch. I have got an impression that I have seen on the New York and New England road point switches put in and not used with an automatic frame.

President—Any further remarks upon this point ?

Mr. Lentell—Mr. President, I would like to ask if any of the New York and New England roadmasters present would give some reasons for using a point switch in that way.

Mr. Sibley—The New York and New England has some rigid stands in their track with point switches, and we have occasion to see them as Mr. Shanks did. Some switches are so that there is a little play before you move the switches, and you move the connection rod almost an inch before you move the switch at all. I don't think that we would be ready to take that for a standard. Our road is using the automatic stand, and we have no fault to find with it at all.

Mr. Paxson—I would like to ask some member of this Association living further north than some of us do, whether it is possible for snow and ice to be packed in so thoroughly between the stock and point rails on an automatic switch, as to spread it wide enough to allow a wheel to pass in on a facing point switch ?

Mr. Hyland—Mr. President, we are in about as stormy a part of the country as anybody, I think. We have used the automatic point for four years, and have had no trouble with snow or ice in any way. It is an advantage in one respect, it forces the train men, if they come along in the night, to clean the switch out before they can throw it.

Mr. Patch—If it will not be out of order, I would like to announce to the chair and to the members, that on account of the running of our trains, we would like to have that special train leave the depot at 3.30 prompt this afternoon. That is only ten minutes ahead of your time, and we will arrive back here at 6.10.

President—You have heard the statement of brother Patch, and you will please take due notice thereof, and govern yourselves accordingly. I promise you that I will get you through if you do as well as you have done. Just keep in the harness, and we will try and keep you at work.

Mr. Shanks—A few moments ago I was on the floor on the switch stand question, and the reason why I brought out that part of the question was that I wished to impress upon you the fact that some of those cheaper stands that are not automatic are used, and when locked, either the point switch or the frame has got to give way if a train leaves the siding or comes to a switch that is wrong for its passage.

President—Any further remarks ? If not, we will pass to the next supplemental question, number seven : "Is the bolted frog with a steel plate six by one under the point of frog on one tie best to use, and what frog is best to use at junctions ?" We might combine those two. Are there any remarks to be offered on that ? I might state right here, if there is anything to be said, that in order to get this matter just where we want it, I shall appoint a committee on resolutions touching this point, taking up this question : "Is not the use of cheap and therefore inferior material and tools detrimental to the general economy of a road ?" For that committee on resolutions I would appoint Mr. Shanks and Mr. Sibley. Have you anything to say upon this point that is now before you ?

Mr. Sibley—Mr. President, I consider the bolted frog, with a fillet and plate under, is the best frog that there is in use, and I would like to see this point brought out, as to what width should be allowed at the end between gauge lines. We have had considerable argument outside of the session as to that. I prefer ten inches at one end and five inches at the other, leaving it so that we can get bolts in. I would like to hear what argument there is against having it that way.

President—That, I would say, would more properly come under the head, unfinished, of the discussion of the best frog, inasmuch as this question does not cover that, although there is a supplemental question here as to what number of frog should be used at junctions. That is hardly covered by the question. We can take that up subsequently, but now I think it would be best, and I wish to confine you right to the letter of the question. If we have any further time to devote, after getting through with more important matters that we have in connection with our first question, and upon which I shall expect every member on his feet during the discussion, we will then look that up.

Mr. Lentell—Mr. President, I think the bolted frog is the best of anything that we have in use yet. The road that I represent does not use a plate under the frog, but I think it would be economy to do so. I believe in a bolted plate frog. In answer to the length of frog to be used at a junction, I don't think that the angle should exceed an eighth, and I don't know as I should reach hardly that.

President—Are there any further remarks ?

Mr. Stickney—I would say that the Boston and Maine road are using a No. 12 double point frog in connection with a heavy rail on the division that I am on.

Mr. Lentell—I would like to ask if they use a No. 12 double point frog at a double crossing ?

Mr. Stickney—I beg your pardon, I misunderstood you.

Mr. Lentell—I would like to ask, Mr. President, what is the length they use, how far they think they can go.

Mr. Stickney—At a double crossing ? That is a thing that I think we have not got on my division.

Mr. Lentell—Simply where one track crosses another.

Mr. Stickney—We don't calculate to use anything smaller than a No. 8.

Mr. Lentell—That is my point.

At the request of the President, the Vice President takes the chair.

Mr. F. C. Clark—I would like to say just a word upon that point for your information, as I am not going to enter into the discussion at all. Having lately become a part and parcel of the consolidated railroads, so-called, I do not feel like introducing any ideas at this time, beyond the extension of the point in question as to the angle of a frog at a junction or crossing frog, as I suppose that is the intention of the question. During the relocation of the tracks of the Housatonic and the consolidated roads at Bridgeport, we used No. 7's for the crossing. We had a succession of derailments upon those frogs, had them quite frequently, until they had laid the movable point frog. That precluded the derailments. Therefore I think that this No. 8 frog is a very sharp angle. I would not be in favor myself of anything exceeding a No. 6 angle at a crossing, as in all cases, where we have had them that exceeded that number or that angle we have had more or less trouble and derailments. Our cars are not always precisely the same gauge, which leaves us in bad shape, and we have been in trouble so many times that I should say not to exceed a No. 6.

The President returns to the chair.

Mr. Greer—I have had some experience with crossing frogs, and I should say No. 7—if it was a stiff crossing, I mean by that ; if it was a movable point crossing I don't think the matter of the angle would enter much into it. But what I mean is, at a stiff crossing not to exceed a No. 7 ; if you do you will get into trouble.

Mr. Braley—I have had a good deal of experience with a No. 9 on the Old Colony. We have adopted the No. 7, and higher than that movable points.

President—Are there any further remarks? The last supplementary question number nine is, "What kind of bolts to use in the track. Would you use in steel rails and steel bars, iron or steel bolts ?"

Mr. Shanks—I would like to know if there is anybody in the room that has ever used a steel bolt.

President—Any one present in the room that has ever used a steel bolt ?

Mr. Drew—Mr. President, I never have used any steel bolts, but I should like to have done so. I have no doubt that they are as much better than iron bolts as a steel rail is better than an iron rail.

Mr. Braley—I have had one lot of steel bolts, and I call them the best kind of bolts. I think they were English bolts.

Mr. Shanks—The reason why I asked the question was this : I never have seen them, although it is in my mind that they would be an excellent thing, and I rather think that the expense would not be very much greater than an iron bolt, probably not over half a cent a pound. I think we would get a great deal better results if they were made of steel, perhaps a low grade of steel. I think the threads would hold better, and they would be more durable.

Mr. Paxson—Wouldn't there be just as much liability to batter up a bolt made of steel as one made of iron? I presume most of our experience has been that when bolts become worthless it is on account of bad management by reason of the foreman or the workmen battering them on the end with a hammer. Very seldom do we see a thread on a bolt stripped, unless they are allowed to be used for a great length of time and rattle; they may probably become worthless in that manner.

President—Are there any further remarks? I will pass the committee's report over into the hands of the committee on resolutions. We want to open up the matter that has developed the greatest interest, that is, the first question. I think I will have to send out a delegation to bring delinquents into the room, as we are going to return to our starting point now, by the introduction of resolutions touching the first question. I want to send out some able-bodied men to bring back those who have strayed from our fold. Mr. McManama, Mr. Greer and Mr. Drew, will you please search the halls, ante-rooms and by-ways of this house, and bring back into the room all the roadmasters not now present that you can find. I want to repeat once more, that when you are called upon to remark touching any question, I desire each member to come right up here in front, so that there will be no trouble in hearing by our stenographer. We want material enough to fill our pamphlet, and we can't have it if we miss your words. I was in hopes to have all members in the room when the resolutions were presented by the committee upon the first question, consisting of our Secretary and newly-elected President, but we have to devote so much time to hunting up delinquents and getting them back into the room that it is certainly impeding our progress very much. I now call for the resolutions of the committee upon our first question.

Mr. French—The committee have presented such an excellent report, such an exhaustive and first rate one in every respect, that the committee appointed to draft resolutions regarding this question, after the discussion, have prepared the following resolutions: You all remember yesterday, when the question was thoroughly discussed, how each member seemed to agree with the excellent points brought out by the committee who framed the report. We have accepted their report as the sense of the Convention. Now, attached to that report are these four questions: 1. "What should be the maximum weight of rail to the yard?" Regarding this we cannot confine ourselves right down to one certain rail section or weight of rail, but we can in a general way answer that question. The committee may not agree with the ideas of all, but at the same time the question has been asked, and we have got to answer it in some way so as to cover it generally. *Resolved*, that the weight of rail should be at least eighty-five pounds per yard for the heavy traffic of the present time. 2. "What proportion should the base of the rail be to the height?" *Resolved*, that the width of base should never be less than the height, and if it can be properly rolled, the width of base should exceed the height. 3. "Should the same number of ties be used to the mile with the heavy rail as with the light?" *Resolved*, that the same number of ties to the mile be used with a heavy rail as with the light. 4. "Would there be a need of tie-plates with the heavy rail, owing to the wider base, to get full value from the ties?" *Resolved*, that tie-plates should be used with all present dimensions of rail, thereby prolonging the life of the tie to an extent that will more than pay for the tie-plates, besides giving the other advantages derived from the use of tie-plates.

The resolutions were accepted and adopted.

President *pro tem*—Is the committee appointed to draft resolutions on the report of the committee on small culverts and cross drains ready to make its report?

Mr. Mosher—Mr. President, the committee appointed to draft resolutions on the second question, which is, "Small culverts and cross drains; best material and form for same," beg leave to submit the following:

*Resolved*, that all small culverts should be covered and all cross drains open.

*Resolved*, that all culverts up to four feet in diameter should consist of one or more cast iron pipes, laid on a sharp incline, the ends set in good rubble laid in cement, and to have not less than one foot of good gravel beneath the bottom of ties.

*Resolved*, that we consider iron pipe as cheaper and more serviceable than stone.

*Resolved*, that cross drains should be of two inch plank, of oak, chestnut, or hard pine, of a width to go between two ties.

President *pro tem*—You hear the report of the committee—what will you do with it?

Mr. Clark—I move that the report be accepted.

Mr. Hyland—Does that motion include the adoption of the report?

President *pro tem*— That, I understand, is the sense of this Convention, unless it is otherwise settled.

Mr. Hyland—Should not the motion be to accept and adopt the report?

Mr. French—I think Mr. Hyland's idea is correct. That was rather left with the committee, and we had a similar job. The committee presented such an excellent report that we felt that it was the sense of the Convention to pass a resolution first agreeing with the committee and accepting their report, and then answering the questions which they had attached to their report. And I think in the resolutions on this third question it should be stated that the report of the committee has been accepted, and that it is the sense of our Convention.

Mr. Bishop—I understand that, according to parliamentary rules, when a resolution of this kind is presented to the Association, you either accept or reject it. If we accept it, we practically adopt that set of resolutions. I think that is generally understood.

Mr. Hyland—I shall take exception to that. I think if we accept the report, we do not adopt it as the sense of this Convention unless we say so.

Mr. Clark—Mr. President, I will withdraw my motion, and allow Mr. Hyland to put it in language to cover the case—suitable to the occasion.

Mr. Hyland—I think the motion should be made that we accept and adopt the report of the committee as the sense of this Convention, and I make a motion in that way.

Mr. Bishop—I second that motion, because I don't see any objection to it. I think it is adoption in either sense.

President *pro tem*—If there is no objection to Mr. Clark withdrawing his former motion, I will put the second motion, which is, that the report of the committee be received and adopted. Are you ready for the question ?

Mr. Hathaway—I would like to ask which committee this means, the committee to report on the question or the committee on resolutions ?

President *pro tem*—The committee on resolutions.

The motion was put and carried.

Mr. French—Mr. President, as there seems to be a little lull while we are waiting for the return of the committee who are drafting resolutions on the next question, I would like to present a few facts regarding the dinner last night. At the Executive Committee meeting in New Haven, when we voted to have this dinner, of course we did not know how many would be present, and therefore did not know the cost of the dinner. But we did vote, as we had a good standing in the treasury, to take $100 out to go towards defraying the expenses of the dinner, and the balance needed to pay the total bill for the dinner it was voted to get by subscription from the members. Now, I have just figured up the cost of that dinner. There were seventy-five present, at $1.50 a plate, which makes $112.50.

We paid $25 for the flowers, potted plants and palms. That makes $137.50 as the total cost of the dinner, leaving $37.50 to be gotten either by subscription or in some other way. We don't want to get this from the supply men, because it was distinctly understood that they are our guests on this occasion, so that the $37.50 really should be made up by an additional assessment. It may not be by a stated amount or it may, but perhaps some of the members will volunteer to give two or three dollars, and others will give half a dollar, just as they feel about it. I wish some one would make a motion as to how we shall raise that $37.50.

Mr. Bishop—Mr. President, I move that a committee of one be appointed to pass around the hat amongst the roadmasters present here and those who may be outside.

The motion was duly seconded and carried.

Mr. Patch—I want to say just one word. There are but a few roadmasters here. Now let us start off generously. Put me in $2.

President *pro tem*—I will appoint Mr. Bishop as that committee of one to make that collection.

Mr. Bishop—Well, I suppose it is customary to appoint the one who makes the motion.

Mr. Mosher—Mr. President, on behalf of Mr. Brady I would like to ask permission for Mr. Brady to take a few moments to present his invention to the Convention.

Mr. French—We have tried to give the representatives of the supply men every courtesy, and we wish to continue to do so. That is our first object, because we depend so much upon them. But regarding having them come into our meeting to show their appliances and devices, if you give that privilege to one it rather strikes me that there will be no end to it, that we should give the same privilege to every other member of the supply people. Now, we have in the circulars which we distributed, an invitation sent to the supply men, wherein we stated that we would adjourn to their rooms at every session, to hear them present their devices and argue for the use of same. Now, I think it would be a little better for all concerned if when

# THE SERVIS TIE PLATE.

Is in use on the following New England Roads:

Boston & Albany,
Boston & Maine,
Old Colony,
Maine Central,
Portland & Rochester,
Concord & Montreal,
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Connecticut River,
Barre R. R.,
Montpelier & Wells River,
N. Y., N. H. & H. R. R.,
N. Y., P. & B. R. R.,
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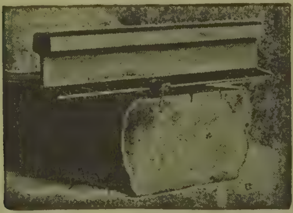
By its longitudinal flanges, becomes a part of the tie, giving permanency, economy, and safety.



**THE Q AND C COMPANY,**

702-707 Phenix Building, CHICAGO.
29 Broadway, NEW YORK.

(Over.)

we close here—and let us close pretty soon now—that we go out there and devote one-half hour to the supply men, letting them argue for the merits of their devices, giving them every chance in the world to tell us about them.

Mr. Clark—I would make a motion that we adjourn to the supply men's room, to meet here at one o'clock.

Mr. French—Mr. President, I would like to ask the members to be prompt in coming here at one o'clock, because we have got to leave here by 3.15 in order to catch the train at 3.30. Let us come here promptly at one, and have a two hours good session. We have amongst the supply men's exhibits this year two or three exhibits that have never been with us before. Now, we should be especially careful to give them due consideration. Two or three of the gentlemen are right here in the room. They have written in the past two or three years that their business has kept them away, and now that they have succeeded in arranging their plans and business at a great deal of inconvenience to themselves to be here with us, I hope you will all give their appliances due attention and consideration, and I trust that every one will go there immediately after adjourning from this room.

Mr. F. C. Clark—I would like to say just a word in reference to the matter that our Secretary has just presented —doubtless I have made myself clear upon this point many times before—that is, the good will and courtesy that we owe to the supply men, notwithstanding our little jokes that we have passed. We recognize the great advantage they have been to us. We all know from recollections of our boyhood, how much easier it was to take a pill that was sugar coated, and they have furnished the sugar coating for the pills of our Convention. Not only that, but the presentation of their appliances has been of unquestionable good to us as an Association. I have it to-day from those who are representing the supply firms—I don't mean members of this Association, but individuals representing the supply firms here to-day with us—that it has been of great advantage to them that they have come here. And why? My friend Mosher of the Boston & Albany road would criticise one point perhaps; my friend Ellis proverbially criticises that which he don't believe to be just right and in accordance with his practice or his experience—and it proves him to be a good, square, upright and progressive man, when he does that. And so I might go on and name you one after the other, each has his point to present, until that appliance, no matter what it is, or into what branch of railroad service it goes, if it has anything to do in connection with the road department, it is all torn in pieces, by the time it gets through this little New England Roadmasters' Association. Its weak points are held up to the scrutiny of every individual, and when that has been done I have sometimes seen them with blanched faces almost ready to go home, thinking that they would give it up, and anything that will make one of these supply men change color, or, in other words, lose what color he has in his face, must be something terrific in its character, because as a class they are *steeled* against everything of that kind. And yet we know that among that class we find some of the ablest, noblest and most honorable men that you can find anywhere. Now, to to come right back to the point at which I started, we want to be careful of our side of the question. We want to do justice to them, because in doing this we are only pursuing the same course that did that individual, of which you and I read years ago, when two of them were riding along in a sledge, and they saw a poor man freezing to death. Said one of the men, "I must go to his assistance." "But," says the other, "you will freeze." "Never mind, I can't see him suffer." And he goes to the assistance of his fellow man, while the other wraps himself up in his furs and sits in the sledge, and nearly freezes to death. He by the exercise that he gets in trying to help his fellow man finds warmth and life and vigor in his system, so that they are both benefitted. Now, what course shall you and I adopt, that of the sluggard and remain wrapped in our furs, or get out and help our fellows. We are helping each other. Our interests are mutual and identical. To the supply men I tender our heartiest thanks for the interest that they have taken in our Association, and for the many kind words that we have received from them. And now to you, fellow roadmasters, I say, by all means go and look over their exhibits; if you have seen them before, look at them again; if you have never seen them, look at them, find out the good there is in them, and let us apply it, and we will thus put ourselves on record as doing something for the good of the corporations that we represent.

President *pro tem*—Brothers, you have by your subscriptions given enough to defray the extra expense of the dinner last evening, for which we thank you all. The motion is made and seconded that we now adjourn to the supply men's room, and re-assemble here at one o'clock.

The motion as stated was carried.

## AFTERNOON SESSION.

At one o'clock the President called the Convention to order.

President—The time has arrived, gentlemen, to which we adjourned. Of course all did not get through their dinners, and we have but few present. I am going to send out brother Brennan to hunt up all the roadmasters he can find and say that it is my wish to have them present themselves in the Convention hall as soon as possible. Mr. Post, you go, too, and help in the matter. We will now listen to the committee who were to report resolutions on the last question. The last question reads, "Is not the use of cheap and therefore inferior material and tools detrimental to the general economy of a road?" The committee consisted of Mr. Shanks and Mr. Sibley.

At the request of the President, the Vice-President takes the chair.

Mr. Bishop—Mr. President, is this question open for discussion now?

President *pro tem*—Not quite. We have not heard the report of the committee on resolutions yet.

Mr. French—That report was handed in by the committee, but being made by only one member of the committee, it was rather incomplete, and we discussed it in only a few words, and then a committee was appointed to draft resolutions regarding that fourth question, as to the advisability of using poor material because it was cheap, and it is all right to discuss that question now.

Mr. Bishop—What I was trying to arrive at was this:

If there is a committee on resolutions, of course it would be well enough to wait for them, but it seems to me that we could answer that with one word, underlined two or three times to make it emphatic, accept the report as rendered by the committee, and let the Convention dispose of it. It occurs to me that there is not much argument needed about this.

Mr. French—Mr. President, the resolution presented by the committee regarding that question of poor material provided for our use, is as follows: *Resolved*, that we denounce the practice of purchasing the cheapest and most inferior material in the market.

Mr. F. C. Clark—I would like to say one word on that resolution—"Resolved that we denounce the practice of purchasing the cheapest and most inferior material in the market." I don't believe you can get up much discussion upon a resolution worded in that manner. I don't believe that you can find a roadmaster, nor yet a purchasing agent of any railroad, but will say that that is strictly proper and correct, "the cheapest and most inferior"—a pretty strong way of stating it. My idea would be, in presenting that resolution, to say, Resolved, that the purchasing of cheap material and material of an inferior quality—not the most inferior—is detrimental to the best interests of the road. Every roadmaster present and every roadmaster absent knows what it is to use poor tools on a road. Take, for instance, the item of shovels. I have had them, since I have been connected with the road that I am now with, purchased at a much less rate per dozen than what they formerly paid. We had one lot of twelve dozen, and before I knew it those we put in use were worthless. You could take one of those shovels by the handle, put your heel on it and double it up as you would a piece of tin almost, or lead pipe. Those shovels were returned, I was ordered to return them. The company disliked to receive them; and therefore we did not accept them. No road would have any shovel of that kind, knowing its condition or its value. Therefore I say if you modify the resolution do not understand me as criticising the gentlemen who presented that, although it is our business if we find a weak statement, or a weak point presented here to unearth that weakness. It is a benefit to them ; and any statement that I may make here now or at any time upon this floor I will thank any roadmaster or any gentleman present to show me the weakness or the impracticability of the statement itself. As I commenced to tell you about the shovels, so it is with regard to nearly all the supplies that we get from some firms, at some time you will get those of an inferior quality. In the matter of spikes, I have had those that when a tie was frozen hard I have seen them break into three pieces under the blow of the hammer. But says some roadmaster, "that hammer was probably wielded by the hand of a greenhorn, somebody that did not know what he was about and struck a glancing blow." It is true that blow may not have been perfectly true, but the spikes were not fit to use. Having driven them home, they were that brittle that on attempting to draw them from the tie, about half of them you would pull the heads off. If they become a little bit bent, you could not straighten them. Now then what we want is first-class material. It is not always the highest priced that is the best, not always. We want material that is of first-class quality and properly made. Then in the hands of first-class men, you can get first-class work, and you cannot get it in any other way. Our superintendents, and so on, up to the highest officers, will go riding over your road, and they will examine your track, perhaps your switches, your bridges and culverts, and everything of that kind. They are always on the alert to see something that is not as it should be. When they find it, it is a very good thing for the roadmaster to be able to give a good reason why that condition exists, a very good reason. If he is not supplied with proper material, in sufficient quantity, and has not a sufficient amount of help to do justice to that piece of road, you cannot expect that he can give them a satisfactory showing, either on his section, if it is a section foreman, or on his division, if he is a division roadmaster. Therefore, Mr. Chairman, I believe that when we adopt a resolution in this Convention we want that resolution to cover the intention, and I would move you that that resolution be amended by striking out those words, "cheapest and most inferior," and substituting in their place, "cheap material of an inferior quality."

Mr. French—I second the amendment. The resolution as amended reads as follows: "Resolved, that we would denounce the practice of purchasing cheap material and tools of an inferior quality, as such practice is in the long run detrimental to the general economy of a road." This refers to both tools and material.

Mr. F. C. Clark—My motion is that the resolution be amended so as to read as it has just been stated by the Secretary.

The motion was put and carried.

The President returns to the chair.

President—Have you any further remarks, gentlemen, upon this resolution? It is now properly before you for discussion.

Mr. Hyland—I move that we accept and adopt the resolution as read.

The motion was duly seconded by Mr. Lentell and carried.

President—Having acted upon all the reports of committees and passed the resolutions, we will now open under the head of unfinished and miscellaneous business, and discuss questions appertaining to unfinished business. Is there any unfinished business to come before the Association? We don't want to go away from here without improving every hour. There was one subject introduced by a supplementary question of a committee which would open up a field for some discussion, if you see fit to enter it. That was in the matter of frogs. The supplementary question read, as presented to you before, "Is the bolted frog, with a steel plate under the point of frog on one tie, the best to use?"

Mr. Sibley—Mr. President, if it is in order to remark on that, when the question was read, I misunderstood it. I said that I considered it the best frog. But reading it over afterwards I see that it says a plate on one tie. That I object to. I like a plate riveted under the frog to cover about three to four ties. It was a mistake in the size of the plate. And the other question brought up was the width of the heel and toe of the frog. I would like to hear some discussion about that, if it is in order.

President—That is the reason I opened up this question for you, that that point might come in in connection with several others, if you saw fit to introduce it. Mr. Sibley wishes to know the distance between the gauge lines at the ends of the frog—that was your question, was it?

Mr. Sibley—Yes.

President—At the two ends of the frog, the distance between gauge lines.

Mr. Sibley—I would like to get an expression of opinion as to what would be the most convenient, and the reasons for a standard gauge line at the end of the frog. We make ours five inches at one end and ten at the other, giving us plenty of room; up to a No. 9 we make it that.

Mr. Hyland—How long would that make your frog?

Mr. Sibley—I would have to know the number of the frog.

President—Can you give us the extreme length of a No. 9 frog laid in that manner?

Mr. Sibley--I can in a few minutes, by figuring.

President—We would like to hear from Mr. Ellis upon this point.

Mr. Ellis—I think the object of Mr. Sibley in bringing up this question is this: On roads that are growing, like his system, made up of different divisions, each division of which has formerly been a road of itself, and has its own frogs--as regards the length and the spread at heel and toe. In a system such as that, of course they may want to interchange those frogs, especially in a change of rail. One division demands that heavier rail be laid than another, and the frogs that have been on that division won't go in the other. Now, if each division has a separate standard of length and spread of heel and toe, there is no chance to have economy step in for wearing of frogs that are scattered around, or, in reality, keeping on hand when emergency calls, frogs that will go on each and every division. And I do know from experience during the past year that that question has been agitated not only on his road, but on other roads. In a yard they should use less length over all, as I claim, than they would out on the main track. There is no need of the length in the yard being as great as on the main line. For eight, nine and ten feet the spread of the heel and toe has got to be more, and should be ten inches at the heel and five inches at the toe, to get your bolts in. I know from experience in the west, that if you leave a frog to a frog maker he will give you for a No. 9 nine feet long, No 10 ten feet long, No. 11 eleven feet, and so on, just the even length. The spread at heel and toe he will make—we will say in a No. 12 it will be eight and four. They run in that way. Or some roads will adopt 8⅜ at the heel and 3⅝ at the other end. But you take on long angles one to ten, and one to twelve, and very probably to within four feet you cannot get the inner bolts to screw up tight when you have not spread enough. And I believe Mr. Sibley spoke of ten inches at the heel and five inches at the toe spread, which in No. 10 and No. 12 will give them leeway for getting their bolts in. And I think the length over all should come in, and there should be also the length of frogs for the yard that should enter into the question.

Mr. Sibley—Mr. President, the No. 9 frog would be eleven feet three inches long, and other frogs accordingly, of course.

President—Any further remarks upon that point? Perhaps our newly elected President could say something.

Mr. Lentell—Mr. President, I don't know as there is much to say about this, but it seems to me that the length of a frog is regulated. All that you want in a frog is to have it long enough so as to get spread enough to get your bolts in, and it seems to me that your length is regulated by that. Now, our No. 8 frogs spread 11½ inches at the heel and six inches at the mouth, twelve feet long. There is another question comes in here ; it would depend on the distance that your holes are apart in your rail in regard to the spread ; the further your holes are apart the longer you have to have your frog to get your bolts in. I believe in a plate under a frog.

President—Any further remarks ? Mr. Bishop.

Mr. Bishop—Mr. President, I was just trying to get Mr. Hyland on the floor, and I prefer his taking the floor now. I believe in having a certain length for a frog, regardless of the number of the frog. I think each road ought to consider the joint they are using, and, as Mr. Lentell says, get distance enough to apply the joint and the bolt, and have all stiff-rail frogs a certain length, and all spring-rail frogs a certain length. On the Fitchburg railroad our spring-rail frogs are fifteen feet in length. The stiff-rail frogs are twelve feet in length, and it is the same distance from the heel to the point of the frog in each case. So that where you take out a rigid rail frog, another one will just fit that particular joint and everything. And so with the spring-rail frog. I believe there should be a plate under the spring-rail frog, extending at least over three ties. I like a pretty good length of frog myself, you can spike it down to more ties and hold it more firmly. Frogs are liable to break down or hump up in the centre, and the shorter the distance you have that hump, the more comfortable is the riding of the train.

Mr. Lentell—Mr. President, I would like to bring in a new question here, just simply to get the opinion of the roadmasters as to what they think of having a cast steel filling, and having it run the entire length, that is to say, having it run to the end of the wings for a foot guard, instead of having one or two blocks in the centre.

President—It is entirely proper to introduce it. I believe we are talking at sort of random, anyhow, for want of something to take up. We are on frogs now, and everything in connection with a frog, as to the style, plate and form, it is entirely proper to introduce. Will some one give us their opinion in answer to the question presented, or any other point in connection with the frog. It is but just to say here, that when a question is presented by any member under—well, we will not say suspension of the rules, but when we are working as we are now, it is entirely proper and just to that member, who is equally interested with us, to answer the question, either from our experience or from our opinion. Will any one volunteer any information or opinion upon that point ?

Mr. Lane—I will say that the Mansfield Car Works, when they commenced to make the rail frog, used a filling the whole length of the wing, as the brother speaks of, but they put in wood filling with a light iron strap on top, and bolted through and made into one block—when they first started out making the rail frog, after giving up their more expensive Mansfield property.

Mr. Stickney—I would like to ask Mr. Bishop if he would advocate making a No. 5, No. 4 and No. 6 frog without these blocks.

Mr. Bishop—I should recommend just that thing. Just one word more. I don't know that I have got anything in my division less than a No. 7 frog. I think that is the sharpest I have got. And with that twelve feet in length, I don't have any trouble in making good line of it and having a good looking job. When you come down to a No. 5 frog, I don't know as anybody can make a good job of that. It is too sharp to turn any engine around that I ever had anything to do with.

Mr. Stone—In many cases where we put in a No. 5 frog, there is a curve both ways on the turnout. Very often where a frog is used where they curve in both ways, it does not show so much, because the curves are slight.

The Vice President takes the chair.

Mr. F. C. Clark—I don't want to say but a few words in regard to this. It seems in the discussion of this question that you are discussing it from two different standpoints: One of the standpoints where you don't go below a No. 7 frog, and the other where a roadmaster perhaps, like myself, is obliged to use them of a much sharper angle. I have even down as low as—or as sharp as a No. 4 frog. With the short frogs we are taking the yard frog. And the main line frog, I should quite agree with brother Stickney, that you could not do justice to your curve by using a straight frog twelve feet in length. Our No. 8 frogs are eight feet two inches and three inches, and eight feet and a half. Our shortest length is No. 6, with the exception of a No. 4, which was one that I had made specially for a certain point. After we get above No. 6 we make the length in feet to correspond with the number of the frog, a No. 7 seven feet long, a No. 8 eight feet long, and so on. It may not be advisable, it may not be best; I simply give it to you as the practice that has been in vogue on our road for some time, although there were some frogs that I found in there of much greater length, and I presume I could determine the reason why they were made of greater length, but it is not to the purpose now.

President *pro tem*—Is there any further discussion on this question?

Mr. French—Mr. President, I have two or three resolutions that we ought to offer:

*Resolved*, that the thanks of this Association be extended to Mr. Henry E. Marsh, proprietor of Cooley's hotel, for the personal interest he has taken in the arrangements made for our pleasure and comfort at this hotel.

*Resolved*, that the thanks of this Association be expressed to the Connecticut River Railroad Company, and especially to the Superintendent, for the kind invitation extended us to an excursion by special train to Greenfield and return.

*Resolved*, that our thanks are due to the representatives of the numerous manufacturers of railroad appliances exhibited at this Convention for the benefit derived from the varied display so conveniently arranged for our inspection.

On motion, duly seconded, the resolutions were adopted, and the Secretary was directed to send a copy to each of the parties mentioned therein.

Mr. French—Mr. President, regarding the Roadmasters' Association of America, and their meeting this fall, I have received a communication from their Secretary, which I will read :

ROADMASTERS' ASSOCIATION OF AMERICA.
Office of Secretary and Treasurer.
*Grand Rapids, Mich., Aug. 23, 1892.*

G. L. R. FRENCH, ESQ.,
Sec. N. E. R. M. Association.

*Dear Sir :*—Your favor enclosing programme of your meeting at hand, for which accept thanks. Our meeting will be held at Chattanooga and Atlanta, Oct. 18–20. The programme of discussions has not yet been arranged, but will include all the subjects in charge of the sub-committees, which are shown in last report of Proceedings, Appendix C. They are of interest to all men in charge of roadway. The committee on arrangements have planned an excursion to St. Augustine, Jacksonville, Savannah and Charleston. I sincerely hope you can arrange for a party from your Association to attend. and will send you copies of programme and arrangements for as many as you think may care to go. We will give them a warm welcome and a seat by the fireside.

Very truly yours,
J. H. K. BURGWIN,
Sec. R. M. A. of A.

Furthermore, I will say that quite a number of our members have spoken to me regarding a party to make the trip down there this fall, after our summer work is closed up. This comes as late as the latter part of October, and as you can see from that letter, they will give us a splendid time, and there will be an opportunity for us to make a trip through the south.

President *pro tem*—I would like to hear some remarks in regard to this trip from some of the members, so that we can get at, if possible, the number that would like to go or intend to go.

Mr. Bishop—I don't know how generally this has been talked of, but I would say that Mr. Hyland, Mr. W. E.

Clark, Mr. Patch and myself—and I don't know but what our Secretary may be induced to go—have talked about leaving here about the 15th of October, going over the Pennsylvania line to Washington, then down over the Richmond & Danville and Western railroads to Chattanooga, taking in the convention, and coming back by the seaboard line, so-called. This is not a private party. If anybody should see fit to accompany us, we should be pleased to have any of you go at that time. We just merely talked this up among ourselves, and thought it would be a desirable trip. If any one should think favorably of it, they can address Mr. W. E. Clark, who is ready to and will advise those who write a letter to him, and they can very readily find out what way we are going, when we are going to leave, and all about it. No private car, but take some good train, and stop off at Washington and other points where we wish to.

Mr. French—I would simply say that towards the latter part of next month it would be proper for me to answer this letter from the Association, as it is directed to our Association, and I would like to be able at that time to tell them whether we shall form a party. So that after you have talked over and found out whether you can make the trip, I wish those who find that they can go would simply drop me a line. They can drop either me or Mr. W. E. Clark a line ; if you write him he will send word to me. I can then let them know whether to expect a party of a dozen or so from here, which they would like to know. So that if you can take it up between now and then, and advise Mr. Clark, Mr. Bishop or myself, we will arrange the whole trip.

Mr. Shanks—Mr. President, I would like very much to go down there if I could see the way clear, and I may before that time, and I think that the suggestion of our Secretary is a good one, and that a little later on we should acquaint him with the facts whether we wish to go.

President *pro tem*—Any further remarks on this question ?

Mr. French—If there is any member in the room who has not paid his dues, I wish when we adjourn that he would step up and settle.

President *pro tem*—Is there any further business to come before this Convention ?

Mr. French—As we shall adjourn very quickly now, and there is considerable time between now and the time when we start on the excursion, I hope we will go back to the supply people, and encourage them for next years's trip. Let us go back there and look their things over again.

The President returns to the chair.

President—If the business is all transacted, it is just as well that we close ; but before doing so, I want to make just one remark, and I want to suggest for consideration during the coming year something that has been suggested to me. I will make the suggestion that you may look the matter over carefully. It is with reference to amending our constitution in such a way as to admit for membership with us roadmasters or go west of the river far enough to receive members from New York State and New Jersey. Remember that I am not at this time advocating this, I simply leave it as a suggestion, something for you to consider, with the hope that when you assemble one year from now in Boston, that not only all who are present and have been present with us this year, may be there, but that the delinquents who are not with us may all be present, so that as nearly as possible our whole membership may be represented. I would like to see new men come in, that we may see seventy-five roadmasters in New England there assembled. I know that we can have a more profitable and more interesting discussion when we get the members out, than we can have with a small delegation like that which we have had this year. Notwithstanding the fact that we had a very fine gathering last evening, I think that so far as the work that we came here to do is concerned, it did not tend to advance it. As a rule, our conventions are the most successful, and fraught with the greatest interest, when we meet in convention, as we ordinarily do, at 1.30, take a recess for our tea, come together again at 8 o'clock, and then have a session lasting until 10 or 10.30, perhaps. We have been known to remain in session until much beyond that time. Some of us who remember our earlier Association meetings, will recall that we came very near passing into the next day before we adjourned. I think we never got quite over into the next day, but very close to it. On such occasions we usually developed a great deal of discussion and much interest in the questions. Some of our roadmasters think that because these questions have been all gone over that the ground is completely covered. But if you will never lose sight of the fact that this is an age of progression, you will also remember at the same time that there should be the same interest in the improvements, and in the progressiveness of our age, and that our discussion in the matter of our supplies, in the matter of our tools, and everything of that kind, should lead us to work with redoubled energy, that we may keep pace with the times. Our Association has received high commendation not only from the press, but from the supply men, from railroad officials, and others conversant with the work that we have ordinarily done in our conventions. How are we going to retain that confidence? How are we going to show them that we have not reached the top round of the ladder and come to a standstill, reached the end of the track? It reaches along, my brother roadmasters, and adown the vistas of time, we cannot see the end of it. There will always be something new, and something attractive, and if you, and I, and every one of us, come together with those thoughts, and with that intention, our annual meetings shall become more and more interesting, and productive of greater good, not only to us, but through us to the railroads that we represent. I now thank you, one and all, for the very kind and generous manner in which you have received every word, every ruling, every request for order, and the decorum which has been displayed. We thank the supply men heartily. We thank the representatives of the press. We thank our visiting brethren, and especially I thank the representative from the New York Central road, who has been with us. We thank him for his encouraging words. Don't think that it was wholly because he was with us that I made the suggestion that I did. And yet it was because he was here, and because of his expression in regard to that one point. Why did he give us that expression? It was a commendation of the roadmasters of New England. When we consider the position he holds, consider why he holds it, and how he holds it, the work that he has done and is doing, we realize that it is just such men, with their ideas and their help, that the New England roadmasters want. We have not tied ourselves up here in a little knot, to withhold our benefits from the world, but they are scattered broadcast, and all that we can do, and all improvements that we can introduce, will result in just so much good. Thanking you one and all for your consideration and your respect, and with the hope that all of us may be spared to meet again, I shall now proceed to close and bid you all good-bye.

# MEMBERS.

| | | |
|---|---|---|
| †Aldrich, M. W. | N. Y. & N. E. R. R., | Needham, Mass. |
| *Beane, A. C. | C. V. R. R., | St. Albans, Vt. |
| †Bodwell, S. B. Jr. | B. & M. R. R., | Lawrence, Mass. |
| †Bishop, G. W. | F. R. R., | Athol, Mass. |
| †Braley, B. | O. C. R. R., | Brockton, Mass. |
| †Brennan, P. D. | N. P. R. R., | Peacedale, R. I. |
| Bryant, E. H. | O. C. R. R., | New Bedford, Mass. |
| †Clark, F. C. | N. Y., N. H. & H., | Falls Village, Ct. |
| †Clark, W. E. | V. V. R. R., | Charlestown, N. H. |
| Collins, R. P. | O. C. R. R., | Readville, Mass. |
| Daggett, G. E. | N. Y., N. H. & H. R. R., | Stamford, Ct. |
| Dearden, W. F. | G. T. R'y, | Richmond, P. Q. |
| Dickey, T. J. | F. R. R., | Boston, Mass. |
| †Drew, J. W. | O. C. R. R., | Hyannis, Mass. |
| †Ellis, W. F. | 620 Atlantic Ave., | Boston, Mass. |
| Follansbee, G. H. | C. R. R., | Keene, N. H. |
| †French, G. L. R. | B. & M. R. R., | Northampton, Mass. |
| Garrison, D. C. | S. L. & N. R. R., | Roxbury, Ct. |
| †Greer, Sam'l | N.Y.,N.H.& H.R.R., | Westfield, Mass. |
| Hammond, H. N. | | |
| †Hathaway, E. O. | C. R. R. R., | Springfield, Mass. |
| Hogan, Thos. | | |
| Holbrook, F. | N. Y.,N. H. & H. R. R. | Stamford, Ct. |
| Horner, E. W. | | Rutland, Vt. |
| Hutchinson, Wm. | B. & M. R. R., | Nashua, N. H. |
| †Hyland, R. | C. R. R., | Keene, N. H. |
| Jackman, E. E. | B. & M. R. R., | Franklin, N. H. |

---

† Members present.

* Died since meeting.

| | | |
|---|---|---|
| †Kilcourse, John | N. Y., N. H. & H. R. R., | Danbury, Ct. |
| Lane, C. S. | N.Y.,N.H. & H.R.R., | Waterbury, Ct. |
| †Lane, J. S. | | Hartford, Ct. |
| †Lavoix, Chas. | B. R. B. & L.R.R., | Winthrop Junc., E. Boston, Mass. |
| †Lentell, C. B. | B. & A. R. R., | Boston, Mass. |
| Letchworth, Sam'l | | |
| †Loomis, E. R. | N. Y., N. H. & H.R.R., | Hartford, Ct. |
| Ludwig, W. B. | W. R. R. | Waldoboro, Me. |
| Lydston, E. W. | | |
| †McManama, J. W. | F. R. R., | North Adams, Mass. |
| †Merrill, W. H. | C. N. E. & W. R. R., | Rhinecliff, N.Y. |
| †Morrill, E. | B. & M. R. R., | Lawrence, Mass. |
| †Mosher, W. T. | B. & A. R. R., | Boston, Mass. |
| †Muzzey, L. M. | B. & A. R. R., | Chatham, N. Y. |
| Nevens, Geo. | M. C. R. R., | Brunswick, Me. |
| Osgood, C. S. | P. & R. F. R. R., | Hartford, Me. |
| †Patch, J. R. | C. R. R. R., | Springfield, Mass. |
| †Paxson, S. C. | N. Y.,N.H.& H.R.R., | Westfield, Mass. |
| Perkins, P. S. | N. Y., P. & B. R. R., | Providence, R. I. |
| †Post, E. K. | N. Y., N. H. & H. R.R., | Hartford, Ct. |
| Richmond, J. J. | | |
| †Sargent, F. M. | O. C. R. R., | So. Framingham, Mass. |
| Shanks, J. L. | F. R. R., | Johnsonville, N. Y. |
| †Shanks, J. W. | C. V. R. R., | St. Albans, Vt. |
| †Sibley, F. E. | N.Y.,N.H. & H.R.R., | Middletown, Ct. |
| Sisk, John, | N.Y. & N. E. R. R., | E. Hartford, Ct. |
| †Slafter, C. S. | O. C. R. R., | Readville, Mass. |
| Smith, R. R. | B. & M. R. R., | Canaan, N. H. |
| Spaulding, L. J. | F. R. R. | Ayer Junc. Mass. |
| Stevens, A. C. | B. & M. R. R., | Beverly, Mass. |
| †Stickney, A. C. | B. & M. R. R., | Lowell, Mass. |
| †Stone, E. E. | B. & A. R. R., | Springfield, Mass. |
| Toomey, D. | N. Y. & N. E. R. R., | Norwich, Ct. |
| †Torr, Jas. M. | N.Y.,P. & B.R.R., | Woonsocket, R. I. |
| Walker, John | B. & M. R. R., | Nashua, N. H. |

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† Members present.

# CONSTITUTION AND BY-LAWS.

**As Amended to August, 1892.**

## PREAMBLE.

We, the undersigned roadmasters, for the purpose of securing more perfect harmony, imparting more general information, and promoting the general welfare of each other, and the roads we represent, form ourselves into an organization, and frame the following Constitution and By-Laws.

## ARTICLE I.

SECTION 1.—The name of the Organization shall be called the "New England Roadmasters' Association."

## ARTICLE II.

SECTION 1.—The officers of this Association shall be a President, Vice-President, Chaplain, Secretary and Treasurer, and Executive Committee of seven, including the President, Vice-President, Secretary and Treasurer. The President shall be chairman of the Executive Committee.

SEC. 2.—All the officers shall be elected by ballot at the annual meeting, a majority of all the votes cast shall be necessary for a choice.

SEC. 3.—The President, or in his absence the Vice President, shall preside at all meetings. In case of absence of both President and Vice-President, the members may elect a President to act pro tem.

SEC. 4.—The Secretary shall keep the records of the Association and Executive Committee, audit all correspondence, and issue notice of all meetings of the Association and Executive Committee, and collect all fees and dues, pay them over to the Treasurer, taking his receipt therefor.

SEC. 5.—The Treasurer shall keep the accounts and be charged with all the funds of the Association, and disburse them under the direction of the Executive Committee, and shall at the annual meeting, or at any other time, if required by the Executive Committee, furnish a statement of funds, income and expenditures to the Association.

SEC. 6.—All bills against the Association must be approved by three members of the Executive Committee before they shall be paid.

SEC. 7.—The Executive Committee shall have the general management of the Association. Three members of this Committee shall constitute a quorum at any regular or special meeting of the Committee.

SEC. 8.—Vacancies can be filled pro tem by the President, or permanently by a majority vote of the members present at any regular or special meeting.

SEC. 9.—All officers of the Association shall continue in office until the close of the meeting at which their successors are elected.

## ARTICLE III.

SECTION 1.—Regular annual meetings of the Association shall be held at some place in the New England States, on the ................................................................................. Special meetings may be called by the Executive Committee or by vote of the members at any regular or special meeting. Seven members shall constitute a quorum of all the meetings of the Association.

Sec. 2.—The order of business shall be as follows :

1. Reading of minutes of last regular and intervening meetings of the Association.
2. Secretary's Report.
3. Treasurer's Report.
4. Roll call.
5. Enrollment of new members.
6. Reading of Communications.
7. Election of officers.
8. Report of committees.
9. Unfinished business and miscellaneous business.

Sec. 3.—Place of holding next annual meeting shall be decided by a vote of members present, or by the Executive Committee of which all members shall receive due notice.

## ARTICLE IV.

Section 1.—Any Roadmaster or Assistant Roadmaster, or Engineer of maintenance of way in good standing on a regularly operated railroad in the New England States, the British Provinces and east of the Hudson River, on securing the majority vote of the Executive Committee present of any meeting of that Committee, or majority vote of members present at any regular or special meeting of the Association and signing the Constitution and By-Laws, paying an entrance fee of two dollars shall become a member of the Association, and shall remain so as long as he pays all dues and assessments promptly, unless expelled.

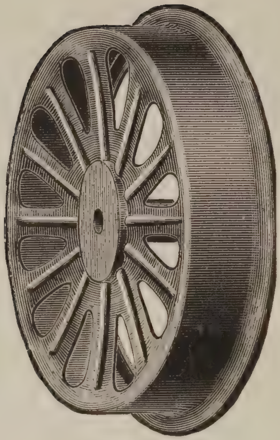
Sec. 2.—Whenever the fee shall prove insufficient for the current and necessary expenses of the Association, then the Executive Committee shall cause to be levied on each member a further assessment, the whole to be approved by a majority vote of the members present at any regular or special meeting.

Sec. 3.—Every member of this Association shall be notified by the Secretary at least two weeks before the special meeting of the Association, of his assessments, and if he shall fail to pay the same on or before the next annual meeting, he shall then cease to be a member of this Association, unless his dues are paid or remitted by a vote of members at any regular or special meeting.

SEC. 4.—Any member may be expelled from this Association by a two-thirds vote of the members present at any regular meeting.

## ARTICLE V.

SECTION 1.—Any portion or the whole of these By-Laws may be amended, or others substituted instead, by a two-thirds vote of all members present at any regular or special meeting of the Association.



*Front View.*

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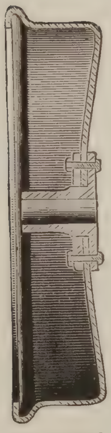

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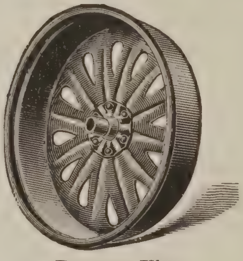

*Sectional View.*

*Reverse View.*

Cannot be distorted in shape by any load that will come upon it in use.
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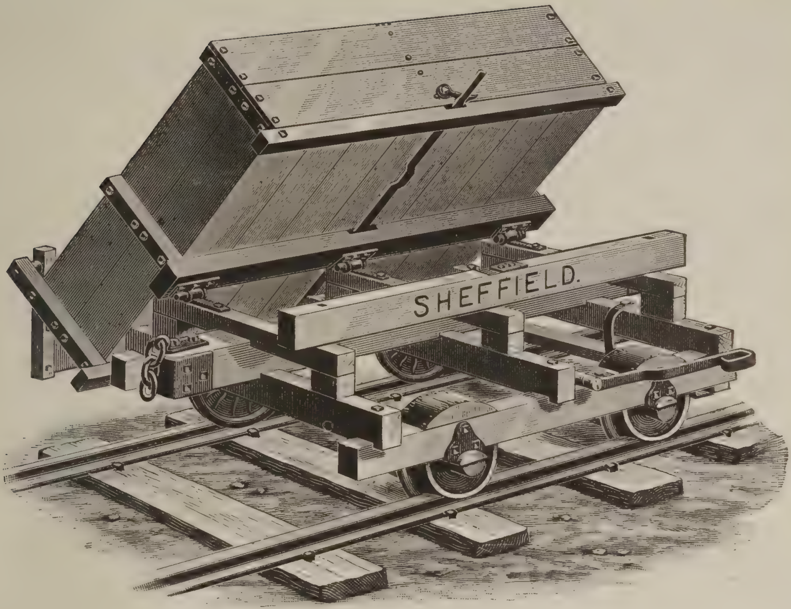

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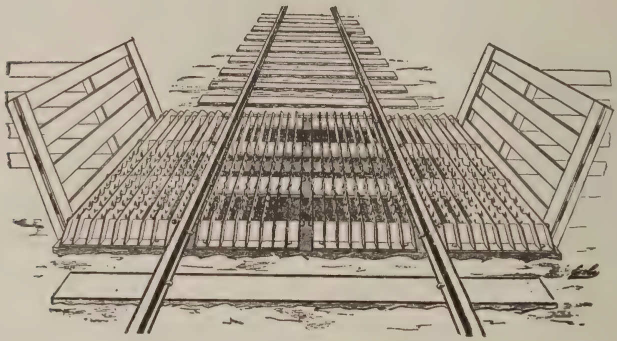
NATIONAL SURFACE GUARD COMPANY.



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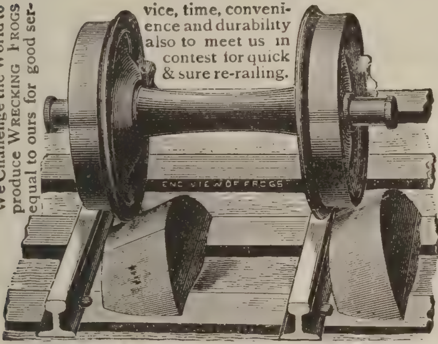
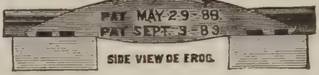


The Tilden Improved Wrecking Frogs for all Railroads, the only strictly reliable invention in use for replacing any derailed rolling stock.

These Extra Improved Replacing Frogs are adapted to any Rolling Stock, and all T rail. Price, in lots of five set or more, only $20.00 per set.

All goods delivered free by freight to any Ry. in United States not west of Missouri River points. To points west thereof we prepay freight free to Missouri River.

Weight of extra improved sizes, about 180 pounds per pair. Correspondence and personal interviews solicited.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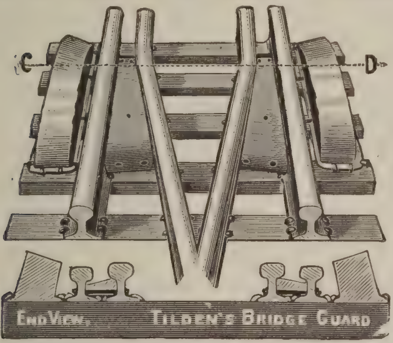
SIDE VIEW OF FROG.

***THE RE-PLACERS FOR RERAILING ANY ROLLING STOCK.***—They will convince any practical operating railroad man of their superiority over all other replacing devices. They will repay for themselves in saving of time over the use of any other Replacers or Wrecking Frogs, as they will replace any cars or locomotive in about one-fourth the time consumed by other Replacers. They will retain themselves where dropped, and save time and expense in any case of derailment. They are in use on several hundred of the principal railroads and giving perfect satisfaction.



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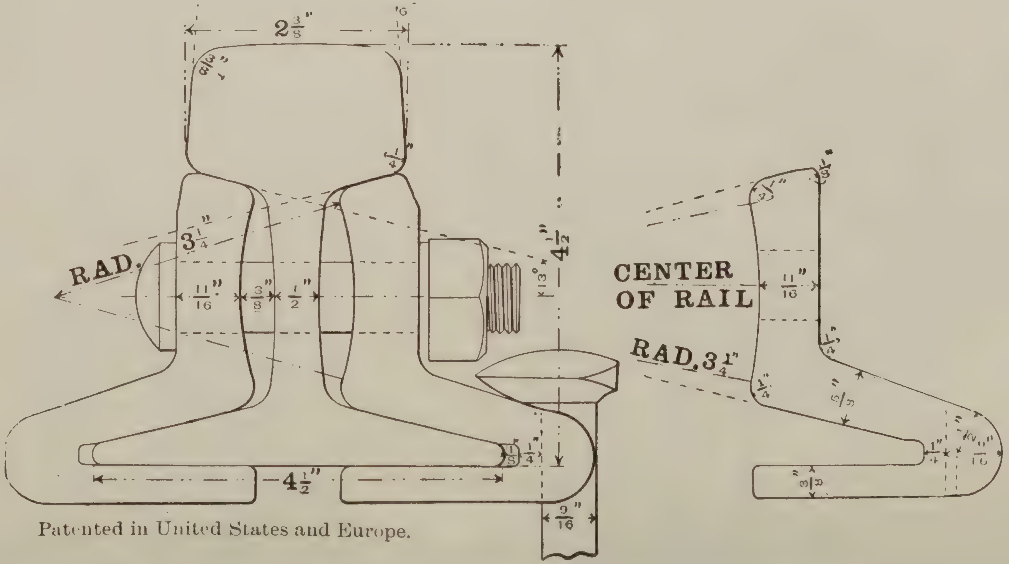

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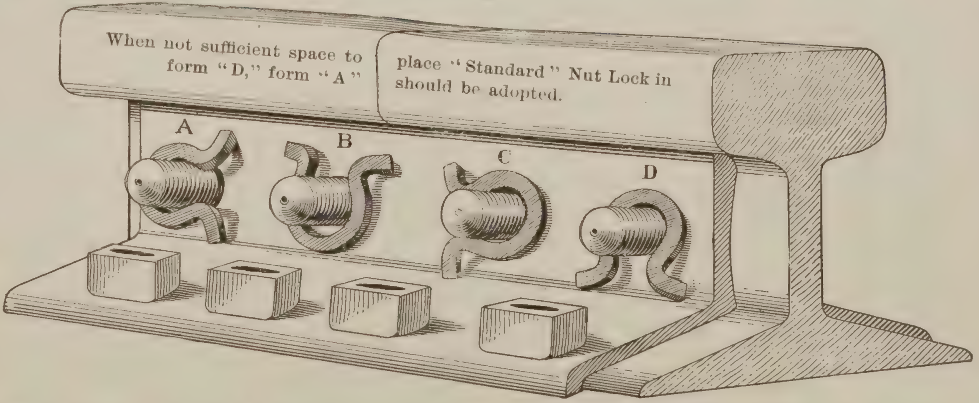
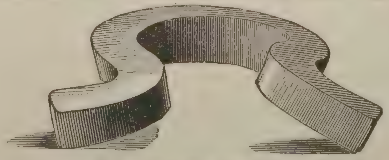

When not sufficient space to form "D," form "A"
place "Standard" Nut Lock in should be adopted.
A
B
C
D

**NOTICE.**—Spring Nut Locks should never be set up dead. Leave 25 per cent. of the original "set" for accommodating spring to expansion and contraction.

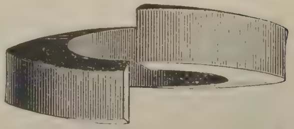
The new cold process oil-hardened and drawn-temper "Standard Nut lock" is the most powerful Compensiling Spring ever made for "taking up" wear and restoring bearings of Angle-bar under head of rail in railroad track. Accumulation of rust, oil, sand and dust, is all the positive Nut Lock required to Lock the Nut to the Bolt.

**DISTINCTIVE MERITS OF THE "STANDARD" NUT LOCK, CONDENSED.**—Fixedness of position—cannot rotate and hammer down threads of bolt. Cannot get one end into elongated slot of angle bar. Unlike any permanently placed, double washer, the Standard *is* interchangeable regardless of distance between bolts. Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up. Has more spring power directly under the nut than any two ordinary coil nut locks. Being fixed in position, it offers double the locking friction of nut locks, which when in their *dead* "set" condition turn back with nut by the vibrative effect of passing train. The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.



***3-4 Standard Nut Lock.***

## 236-248 Bank Street, NEWARK, N. J.



***No. 1 Plain Square Nut Lock.***

# Roadmaster and Foreman

## THE AMERICAN RAILWAY TRACK JOURNAL.

### ILLUSTRATED.

F. A. SMITH, EDITOR. B. S. WASSON, MANAGER.

SPECIAL CONTRIBUTORS.

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D. Sweeney, Division Roadmaster, C. R. I. & P. Railway.
Joseph Kindelan, Roadmaster C. M. & St. P. Railway.
H. W. Reed, Master of Roadway, Savannah, Florida & Western Railway.
A. C. Goodrich, General Manager, Keokuk & Northwestern Railway.
William Barclay Parsons, C. E., author of "Parsons' Track."
J. M. Meade, Resident Engineer, A., T. & S. F. Railway.
James K. Geddes, Chief Engineer and Roadmaster, B., Z. & C. Railway, and M. Am. Society of C. E.
Robert Pottol, Section Foreman S. P. Railway.
Charles Dinckelbihler, Section Foreman Mexican International Railway.
T. W. Jones, Permanent Way Inspector, East India Railway.

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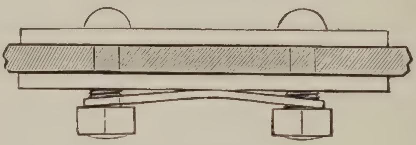
# EXCELSIOR SINGLE AND DOUBLE

# Automatic Nut Locks

— OR —

# FISH PLATE SPRINGS.



**Double.**

It is well understood in mechanical practice that where a combination of iron plates are "screwed together with bolts and nuts, and subjected to jar, that said nuts, bolts and plates will become loose." And in no place does it appear to give more trouble than on railroad tracks, where the joints are so numerous and the jar is so heavy, by trains running over them, which causes friction, and the nuts, bolts, and fish plates become loose and rattle. We find in our EXCELSIOR AUTOMATIC NUT LOCKS OR FISH PLATE SPRINGS a positive remedy.

Place the springs as shown in cut, with the eyes bearing outward against the nuts, and screw them up the usual way, by which the springs are compressed against the fish plate, the two ends of the springs becoming levers pressing against the nuts; the springs now become permanent automatic levers, pressing heavy between the nuts and the fish plate.

By this invention the loosening of the nuts, bolts and plates is prevented, and the joint is as solid as any part of the rail. They cannot rotate with the nuts, and are not easily lost or mislaid. They make a permanent, fast joint, and saves the labor of track-men screwing up nuts.

The single Nut Locks can be used on bolts for switches, as well as rail joints, and all places where distances are irregular between bolts.

They are patented in the United States, Canada, England, France, Germany and Belgium; and we claim that they are cheaper, more durable and effective, and, being hardened and tempered, always retain their life and elasticity. And we challenge all competitors for their equal in effectiveness and durability.

*These Nut Locks have been adopted by the New England Roadmasters, in Conventions held at Hartford, Conn., October 19th and 20th, 1887, and Boston, Mass., August 15th and 16th, 1888, as the best Nut Locks known.*

In placing the double spring on the bolts, the centre of spring should bear on the fish plate, and screw them up the usual way.

Sample lots furnished for trial, *free of expense*, by forwarding the distance between centres of fish plate bolts.

Correspondence and orders solicited.

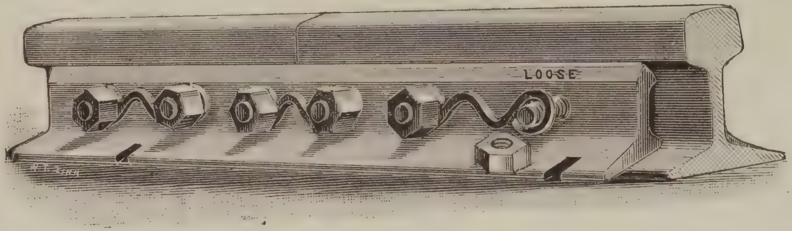
## RUFFNER & SON,

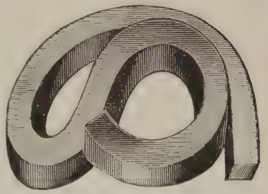
**MANUFACTURERS,**

**SCHUYLKILL FALLS, - PHILADELPHIA, PA.**

# THE EXCELSIOR SINGLE AND DOUBLE

# Automatic Nut Locks and Fish Plate Springs.





Single Nut Lock.

The Excelsior Automatic Nut Locks and Fish Plate Springs, the cheapest, most durable and effective Nut Locks, known in use.

Sample Lots furnished for trial, free of expense, by forwarding the distance between centres of fish plate bolts. Correspondence and orders solicited.

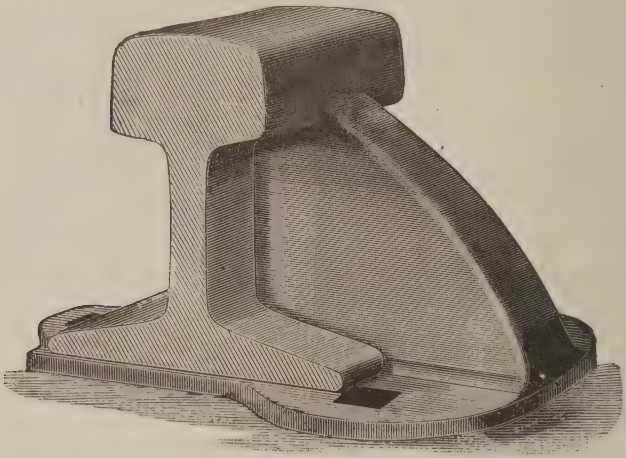
These Nut Locks have been adopted by the New England Roadmasters, in conventions held at Hartford, Conn., Oct. 19th and 20th, 1887, and Boston, Mass., August 15th and 16th, 1888, as the best Nut Locks known.

**RUFFNER & SON, - Manufacturers,**

SCHUYLKILL FALLS, PHILADELPHIA, PA.

# THE STANDARD

# Combination Tie Plate and Brace.



*Patented Sept. 6, 1892.*

**THE STANDARD COMBINATION TIE PLATE AND BRACE** possesses the following merits :

1. It prevents absolutely the cutting of the rail into the tie, thereby greatly increasing the life of the tie.

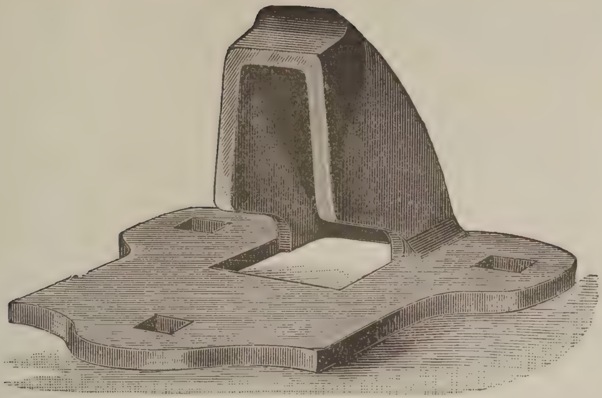
2. It prevents the rail from spreading or canting over and wearing one side only.

3. The combination of the brace and plate obviates the necessity of spiking the rail and brace separately, thereby saving two spikes and securing the service of the *inside* spike for *holding* the rail ; it also prevents the rail from working up and down and laterally, thus making it impossible to wear *the neck of the spike.*

4. The plate and brace being made of malleable iron, is practically indestructible.

The tie plate and brace is especially useful for curves and guard rails, and also on bridges, whether the rail is laid on ties or on stringers ; in the former case the ties are cut out long before their life is spent, and in the latter the lateral motion splits the stringer ; by the use of the plate and brace this is entirely prevented, thus saving the great expense attending renewals at such points. A tie plate without a brace will not save the head of the spike. A brace without a tie plate will not save the tie, and in a short time the rail will wear into the tie and the brace will take the position as shown in cut on opposite page.

**206 South Fourth Street, PHILADELPHIA.**



The locomotives and rolling stock generally of all progressive railroads in the United States have been increased so in weight within the past few years that the bare wooden tie is no longer able to withstand the pressure and wear even though they be of the best white oak.

On roads where the traffic is heavy the ties are removed, not because they are decayed, but for the reason that rails have cut so deeply into them that in following up this wear under the rail the spikes are driven entirely through the tie and thus loose their efficiency for holding the rail safely in place; this is especially so at terminals. The only remedy is a steel tie or tie plates. A steel tie that meets all requirements has not yet been devised. The chief objections are :

First cost, lack of elasticity, inability to preserve surface and true alignment, a fastening that will not wear and rattle and yet admit of rails being drawn up to gauge as the side of the head is worn off. The wooden tie, whether of hard or soft wood, with a tie plate that will at least double its life is still on top. We would, therefore, invite a trial of the **Standard Combination Brace and Plate**, and will be glad to furnish prices, etc., upon application to

# The Standard Combination Tie Plate and Brace,

206 South Fourth Street, Philadelphia.

---

## This cut was taken from The Railroad Gazette of February 19, 1892.

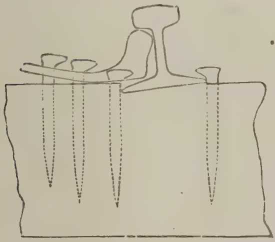


Figure represents a rail brace as it rocks and is pushed out in its effort to support a canting rail, which more slowly, but just as surely, sinks its outer flange into the tie. The rail brace affords no support for the base of the rail, but essays to prop it up under the head, which it fails to do, and only takes position as shown in cut.

# DILWORTH, PORTER & CO.,
(Limited.)

PITTSBURGH, - PENN.,

. . MANUFACTURERS OF THE . .

# GOLDIE PERFECT SPIKE.

. . . ALSO, OF ALL KINDS AND SIZES OF . . .

## Railroad,

## Street Railway and

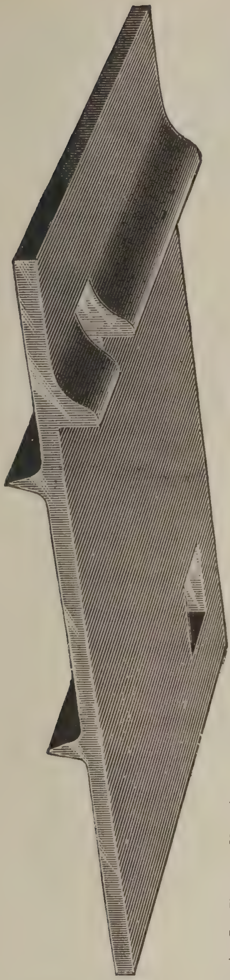
## Boat Spikes.

Our spikes are all made from the best quality of Soft Steel, no scrap or old rails being used, and we can confidently state that the universal opinion of Railroad Track Officials is, that in point of superior quality of material, and excellence of manufacture, our goods are not approached by those of any other manufacturer.

---

**The Goldie Spike has the following advantages:**

It is sharp, and has a perfect point. . . . . . . . . . . . .
It is reinforced in the neck, giving double wear over other makes.
It has 20% more holding power in oak, and 40% to 100% more in
. . soft wood than the Common Spike. . . . . . . . . .
The head cannot be broken in use on rails, or in the slots of angle
. . bars and braces. . . . . . . . . . . . . . . . . . . . .
Twenty-five per cent. of all Standard Sized Spikes used this year
. . in the United States have been Goldie Perfect Spikes. . .
This record within three years speaks for itself. . . . . . .



# DILWORTH, PORTER & CO.,

## (Limited.)

PITTSBURGH, PENN.

. . MANUFACTURERS OF THE . .

# GOLDIE

# TIE PLATE.

. . . . . .

This plate is rolled by us from the same kind of material as the spike.

It has a rib on the upper side to receive the lateral thrust of the flange of the rail, and thus prevents entirely the wear on the neck of the spike, and its liability to being sheared off; this is a difficulty that is exceedingly prevalent with all other makes of tie plates.

It has on the under side two ribs, having sharp edges that enter the tie at right angles to its grain, thus giving it the holding power of many spikes against widening of the guage.

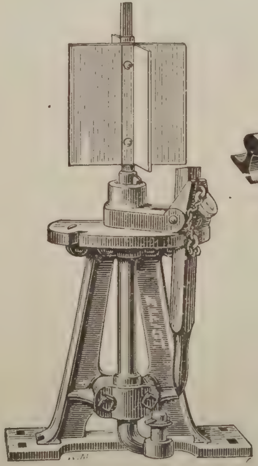
Our prices for both Spikes and Tie Plates are always as low as are consistent with the best quality of material, and the highest possible excellence in manufacture.

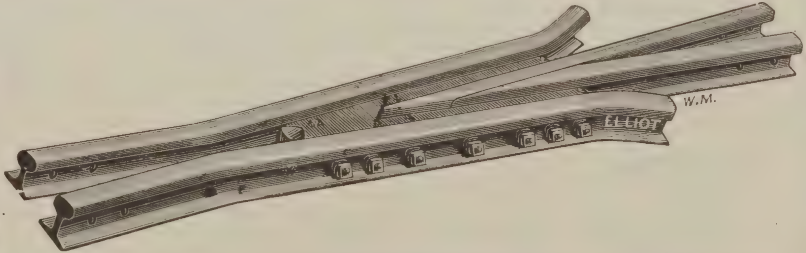
If you are not using our goods, send for prices and information.

# ELLIOT FROG & SWITCH CO.,

—— MANUFACTURERS OF ——

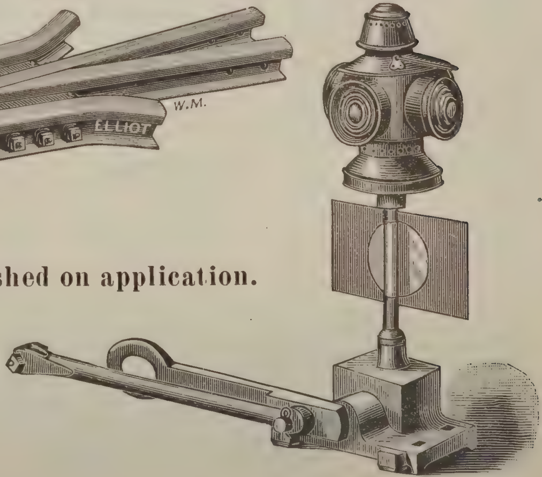
Split Switches, Spring Rail Frogs, Lap Switches, Rigid Frogs with Solid (Welded) Filling, Bridle Rods, Wrought Iron Head Chairs, Rail Braces, Replacing Frogs, High and Low Revolving Switch Stands for Main Line or in Yards, Automatic Switch Stands.



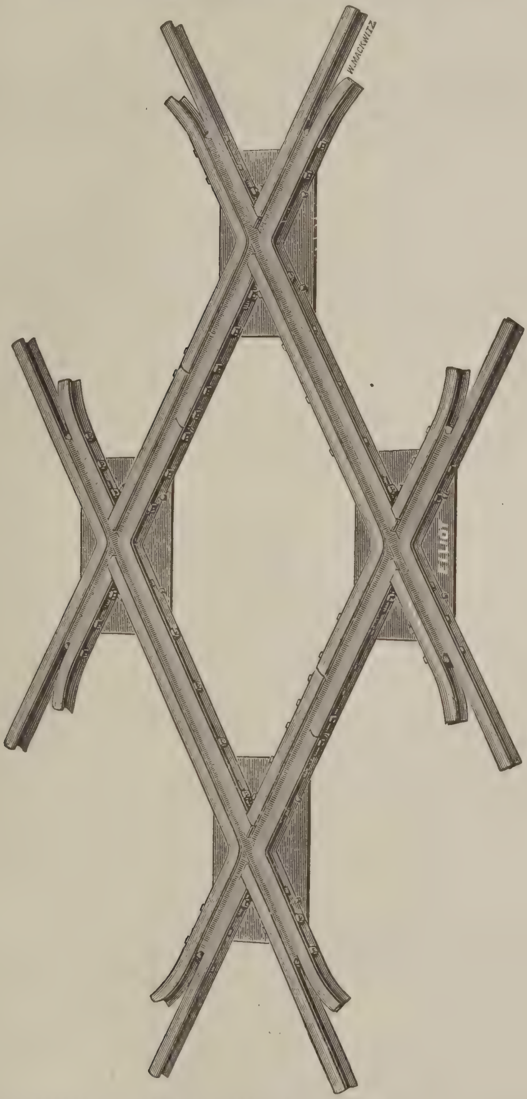


Catalogues and Estimates furnished on application.

EAST ST. LOUIS, - ILLINOIS.



*R. R. Frogs, Crossings, Switches*
**AND SWITCH STANDS,**
MANUFACTURED BY



Frogs and Crossings made any angle desired or of any section of rail. all sizes of which are carried in stock.

ELLIOT FROG & SWITCH CO., East St. Louis, ILLINOIS.

# RAMAPO IRON WORKS.

ONE OF ITS SPECIALTIES:

# Flange Brake Shoes.

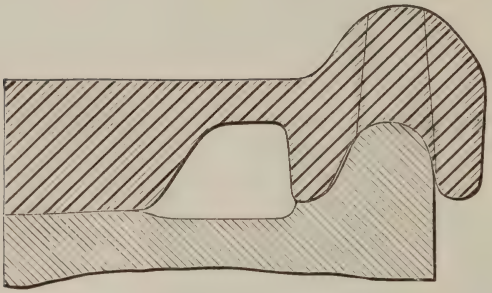


*Fig. A.*
POSITION OF ROSS SHOE WHEN APPLIED TO WHEEL OPPOSITE OF SHARP FLANGE.

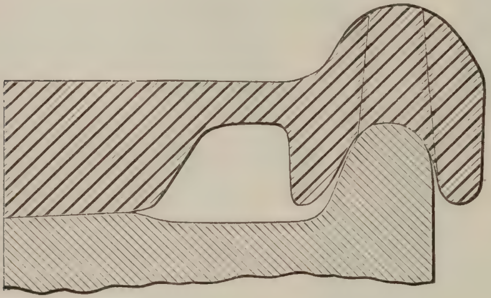


*Fig. B.*
POSITION OF ROSS SHOE APPLIED TO WHEEL WITH SHARP FLANGE.

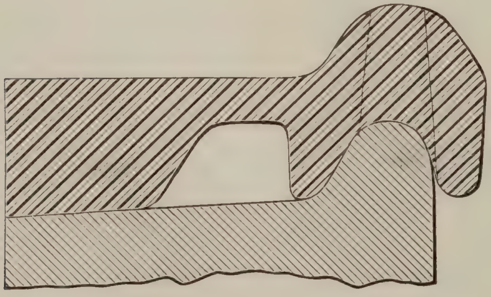


*Fig. C.*
HOW ROSS SHOE FITS WHEN BOTH WHEEL AND SHOE ARE NEW.

*HERE ARE SOME OF THE REASONS WHY THE*

# Ross Brake Shoe

## *PREVENTS FLANGE WEAR:*

It is a well-known fact that the trucks of a new car are generally rigid on account of extra friction on the center-plates, journals, and other causes, thus forcing one of the flanges of the wheels against the rail until the opposite wheel has worn a slight groove in the tread, like shown in figure A ; this causes a continuous rolling of the wheel in the groove first formed. Notwithstanding the truck may have become perfectly free by its frequent changes on the curves, the wheel will still roll in the same position.

The application of the Ross Shoe as shown in figure A, will very soon wear away the raised part and second flange, and thus permit the free oscillation of the wheels on the track.

It will be seen by the diagrams herewith, that the shoe on the sharp flange wheel will not touch that part of the flange already worn until it assumes its original shape, thus keeping both flanges and tread in good condition, thus saving frogs and switches, as well as the rolling stock.

The Robert W. Hunt & Co.,

*BUREAU OF INSPECTION.*

Tests and Consultation,

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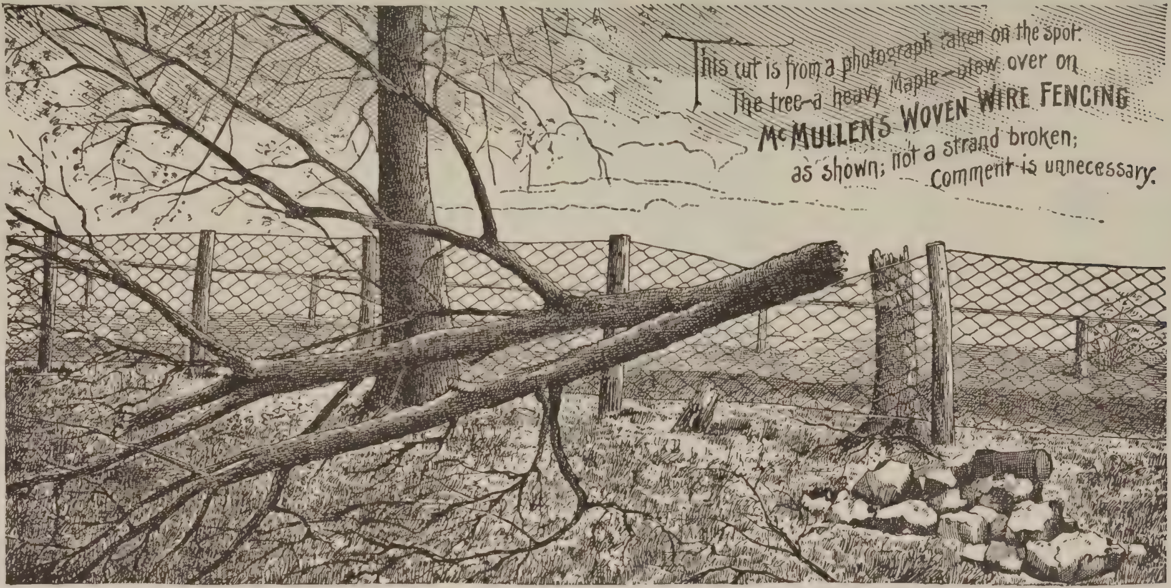
# McMULLEN'S WOVEN WIRE FENCING.



This cut is from a photograph taken on the spot.
The tree—a heavy Maple—blew over on
McMULLEN'S WOVEN WIRE FENCING
as shown; not a strand broken;
Comment is unnecessary.

| Some fifty Railroads Now have our . . Fencing in use. . | THE McMULLEN WOVEN WIRE FENCE CO.,<br>North Market and Ontario Sts., - - CHICAGO, ILL. | Special Prices . . Made to Railways And their Employes |
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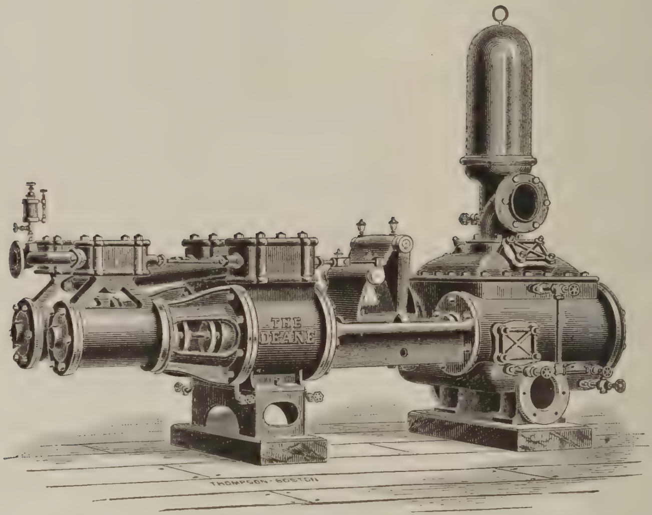
The Deane Steam Pumps

OF HOLYOKE.



Water Works Engines,
Pumps for Railroad Use.

SEND FOR ILLUSTRATED CATALOGUE.

Deane Steam Pump Co.,
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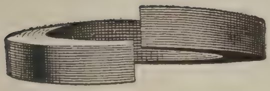
ST. LOUIS. DENVER.

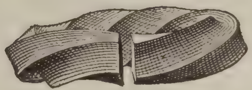
# WHAT EVOLUTION HAS EVOLVED

. . . IN . . .

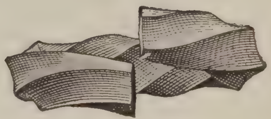
# NUT LOCKS.



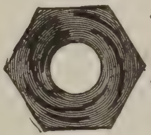
**GOOD.**
First came the Spring without the Twist.



**BETTER.**
Then followed the Twist without the Spring.



**BEST.**
Now we have the Twist and Spring Combined



**The Cutting Edges imbed themselves in the Angle Bar$^2$ and in the Nut like this, Effectually Locking the Nut, without injuring the THREAD.**

Patented Nov. 8th, 1881, and Nov 14th, 1883.

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EVERY LOCK TESTED BEFORE LEAVING THE WORKS.

MANUFACTURED FROM THE BEST CRUCIBLE SPRING STEEL

. . . BY THE . . .

# AMERICAN NUT LOCK CO.,

**215 and 217 Biddle St.,**

ST. LOUIS, . . . MO.

SAMPLES FREE ON APPLICATION.

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**CHICAGO OFFICE:**
Room 470 the Rookery,
***JNO. W. CLARKE, Agent.***

**PHILADELPHIA OFFICE:**
Room 110 Bullitt Building,
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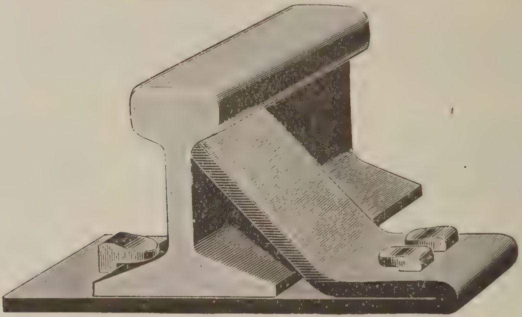
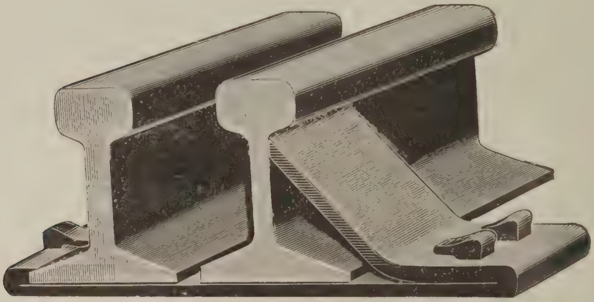
# THE EDWARDS' RAIL BRACE!

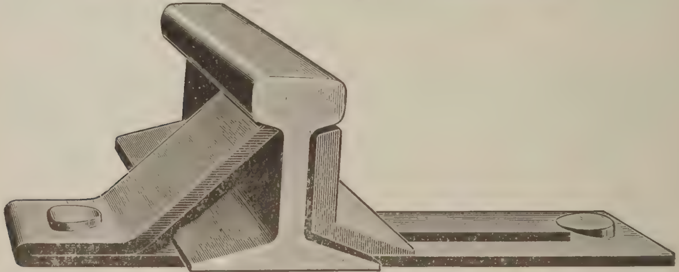
Patented Dec. 17, 1889.



COMBINED TIE PLATE AND BRACE FOR CURVES.



GUARD RAIL BRACE.



COMBINED SLIDE PLATE AND RAIL BRACE FOR SPLIT SWITCH.—SWITCH CLOSED.

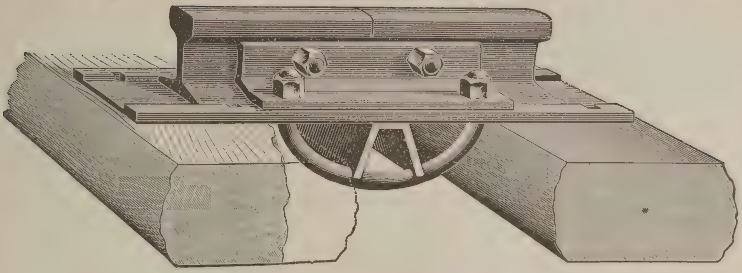
*MANUFACTURED BY THE*

## PAIGE IRON WORKS,

26 to 38 Ontario St., cor. Kingsbury, CHICAGO.

**Frogs, Switches and Crossings, Switch Stands, Switch Rods, Cast and Wrought Iron Head Chairs.**

# THE TRUSS RAIL JOINT.



## ✣ FACTS. ✣

**FIRST.**—It is a bridge joint in the broadest sense of the term, and embodies in its construction well established and scientific principles.

**SECOND.**—It combines necessary strength and flexibility, so that the conditions between the joint ties are essentially the same as between the other ties under the rail.

**THIRD.**—All concussion due to pounding is elminated, the truss so supporting the rail ends, that the deflection is practically the same at the "joint" as elsewhere under the rail, and is taken up by the Radial Truss Rods.

**FOURTH.**—It makes the alignment of the track at the joint positive, as the base of the rail rests in the channel of the base plate, and being held in position by the truss rods and truck bolts, lateral movement is impossible.

**FIFTH.**—It is impossible for the rail to creep, as it is bound to the base plate through the truss rods, angle plate and track bolts, and the base plate spiked to the ties; the truss rods also bearing against the ties under the base plate.

**SIXTH.**—As the angle plate in no way supports the rail vertically, not even engaging the head, the lateral strain is removed from the track bolts, and the strain on the truss rods being wholly vertical, and there being a reciprocal strain on both, through the angle plate, the nuts are firmly held, and nut and locks are unnecessary.

**SEVENTH.**—Within reasonable limits low rail ends can be raised and leveled in old track. Adjustability is one of our prominent claims.

From the experience had thus far with this device, covering three and a half years, it is evident that it will maintain the rail ends in line and surface without battering as long as the rail lasts, with no more cost for maintenance than for the rest of the rail.

We will replace any breakage due to defects in material or manufacture, occurring within five years from date of sale, without cost to purchaser.

We have abundant evidence to substantiate all we claim.

---

FLINT & PERE MARQUETTE RAILWAY.
SAGINAW, MICH., March 30, 1892.

*Wm. S. Brewster, Esq., Chicago, Ill.*

DEAR SIR :—We have now used the "Long's Truss Joints," on 4 miles of track about two years, and they have given better results than any joint we have ever used. We used some care in selecting joint ties of even size, and being beaten packed, the men say they stay in place better than the ties under other parts of the rail. We do not have any trouble whatever with the truss bolts freezing in the ballast. It is an exception now to find a joint of 1-16 of an inch low when tried with a square.

In putting the joints in, the men should use care not to spring the rails above a perfect level My observations agree with the report of the Engineer of the C. & N. W. R'y Co. Very truly yours, GEO. M. BROWN,
SUPT. ROADWAY.

THE TRUSS RAIL JOINT CO., *Rooms 311 Home Insurance Building, CHICAGO, ILL.*

# THE EMERSON

# Rail-Bending and Straightening Machine

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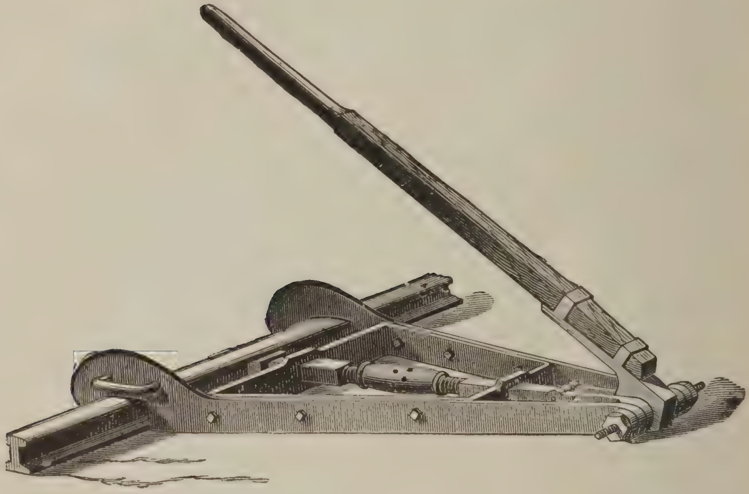
**Made of best Wrought Iron and Wrought Steel.**

**Interchangeable Parts always in Stock.**



SIZES:

No. 2.—Guaranteed to bend rails 45 to 65 lbs. to the yard.
No. 3. " " " 65 to 90 " " ".

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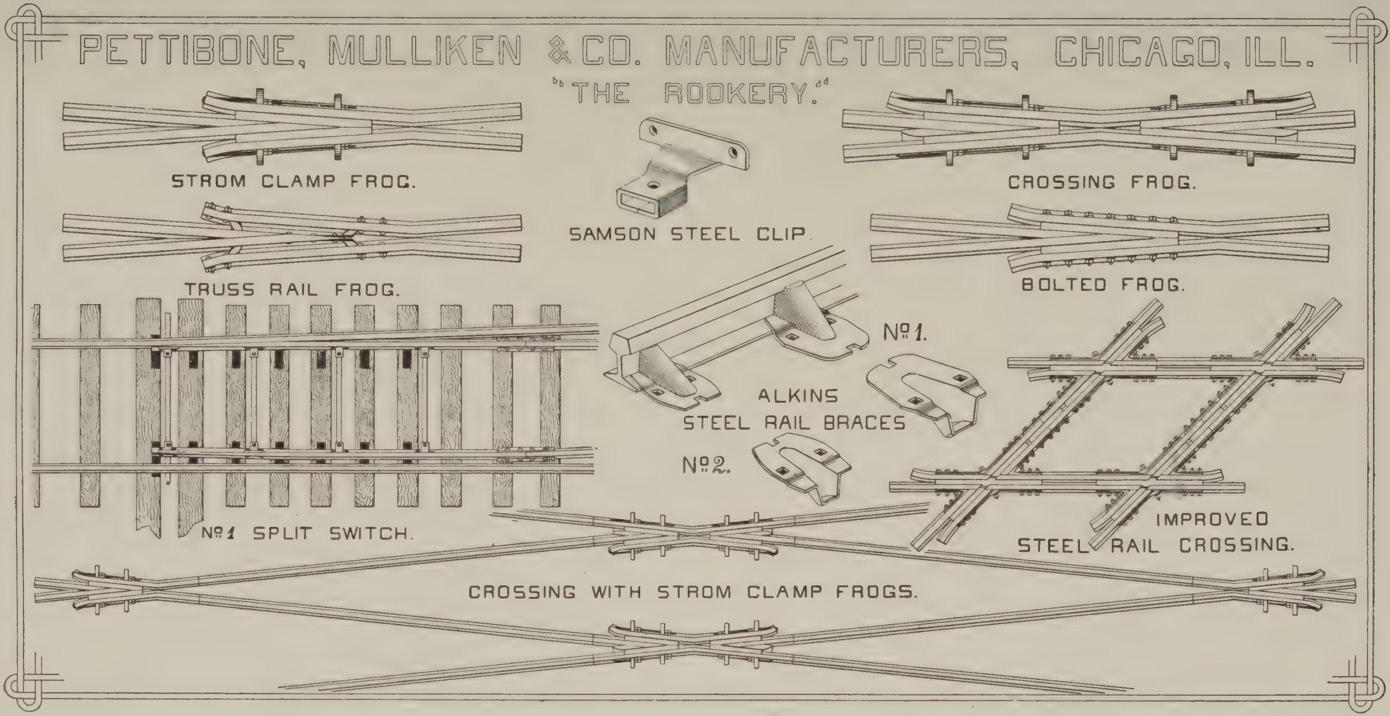
*These Machines are in use on the principal railways in the United States and other countries. Highest testimonials furnished. For further information, address*

**M. H. BROWN,**

**45 Broadway, Room 87, - - NEW YORK.**

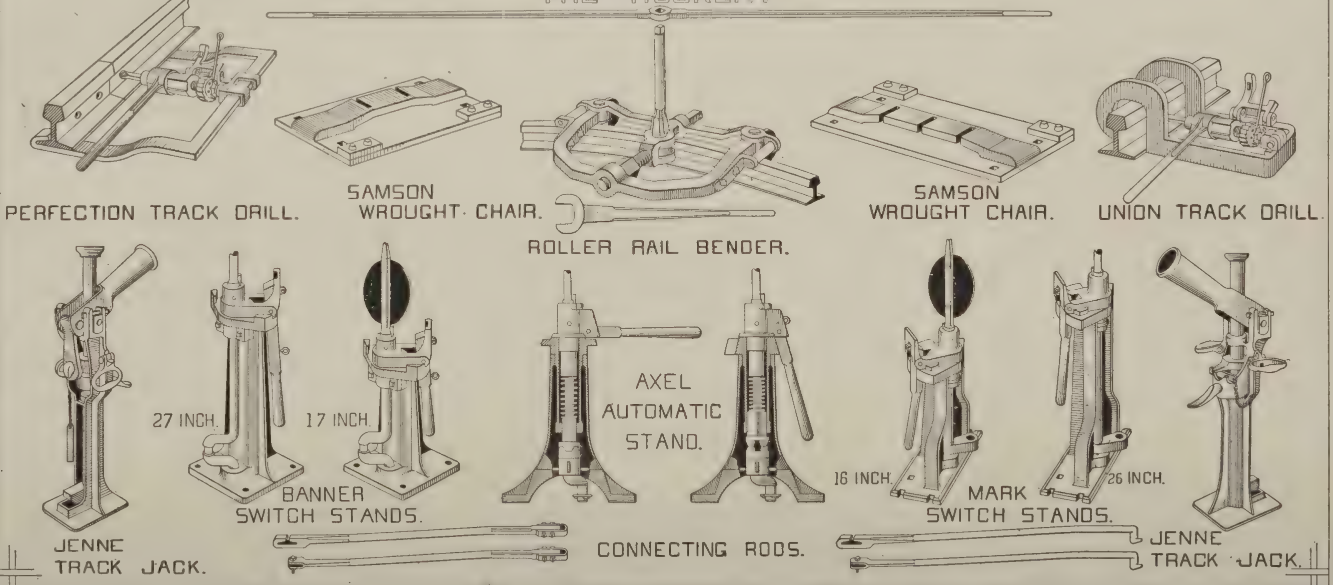


# PETTIBONE, MULLIKEN & CO. MANUFACTURERS, CHICAGO, ILL.

"THE ROOKERY."

# PETTIBONE, MULLIKEN & CO. MANUFACTURERS, CHICAGO, ILL.

"THE ROOKERY"


PERFECTION TRACK DRILL.
SAMSON WROUGHT CHAIR.
ROLLER RAIL BENDER.
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JENNE TRACK JACK.
27 INCH.
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BANNER SWITCH STANDS.
AXEL AUTOMATIC STAND.
16 INCH.
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MARK SWITCH STANDS.
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# JOYCE, CRIDLAND & CO

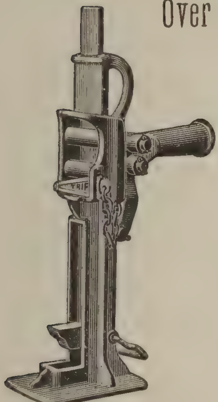
## DAYTON, OHIO,

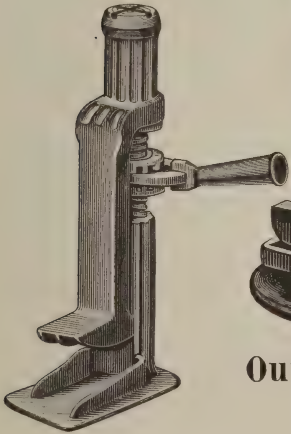
Manufacturers of J. O. Joyce's Patent.

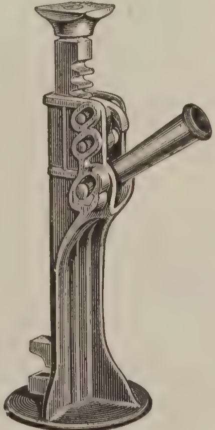
*Lever Jacks, Compound Lever and Screw Jacks . . . and Bench Vises. . . .*

**Please send for Illustrated Catalogue.**

Over **60** varieties of JACKS mostly for railroad use.







Our Track Jacks.

# PENNSYLVANIA STEEL CO.,

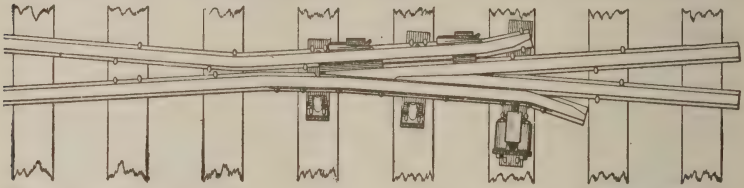
STEELTON, PA.

## STEEL RAILS

All Weights.
All Patterns.

STEEL SPLICES AND FASTENINGS.

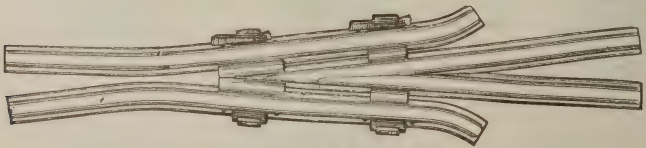
**BRIDGES, VIADUCTS, ROOFS AND BUILDINGS.**



## Spring Rail Frog, Keyed Pattern, Improved.

This Spring Rail Frog excels all others in Safety, Strength and Durability, Noiselessness and convenience in placing and maintenance ; and in main line tracks is the most economical Frog that can be used. The fixed parts are bound inside of strong clamps, which are so immovably secured are much stronger than any other mode of fastening the parts, and may always be tightened, as parts wear, to keep everything snug and solid, and avoid rattling. The spring rail is guided and kept in place by the strongest and most efficient devices in use, the spring rail being strengthened and secured against breaking. The peculiar form of the spring rail provides for all conditions of wheels the most secure bearing and support ever attained in Spring Frogs.

The special improvements relating to the Spring Rail are also applied in various patterns of Bolted and Riveted Spring Frogs, when such are required.



The **PATENT KEYED PATTERN STIFF** Frog continues the favorite Rigid Frog, and is sold more extensively than any other pattern of Rigid Frog. It is of the strongest possible construction, simple and reliable, easy to place and keep in condition to obtain the utmost durability of the steel rails of which it is made.

## Stiff Frogs of Various Riveted Plate, and Bolted Patterns

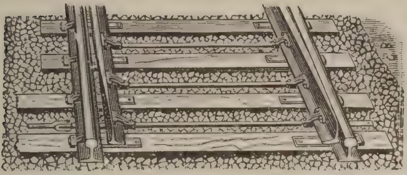
Are also supplied to many roads, and our facilities for making them, at favorable prices, are not surpassed. Various methods of fitting, as preferred.

**CROSSING FROGS** OF EVERY REQUIRED ANGLE are constantly produced, in large numbers ; some, of the most complicated character. The constructions vary according to requirements. The materials used are always of the best quality for the purpose. All filling is the toughest soft steel, specially rolled, and the bracing is of the heaviest sort.

### Combination or Slip Crossings,

Such as required in making thoroughfare cross-overs over parallel tracks ; made with the most convenient and durable arrangements for operating the Split Switches ; easily placed and satisfactory. Our experience in this line is extensive.

# PENNSYLVANIA STEEL CO.,



## *SPLIT SWITCHES*

AND

## Lorenz Safety Switches

WITH

*Interchangeable Parts.*

Unsurpassed Workmanship & Fit.

Having unequalled facilities for their production, either for quantities or qualities, invite attention thereto. Have six different (standard) patterns of construction, suited to all requirements, and make several other patterns (on specifications). Imitations of our patented special patterns are extant, of which the public are warned. Slide plates or friction plates are Steel, and Braces of Wrought Steel; both, combined, make the *Ideal Switch Plate.* Switch points fitted as required, and elevated as in Clark-Jeffery Switch, when required.

### Patent Three-Throw Split Switches,

Operated wholly by one-hand Lever. Wherever it is necessary to retain three-throw switches this improvement should be used. It is justly regarded as the most satisfactory three-throw arrangement on the market.

### IMPROVED PATTERNS OF SWITCH STANDS.

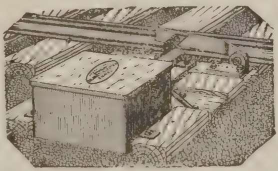
Wrought Steel Guard Rail Braces.

## MAGNETO ALARM SIGNAL for HIGHWAY CROSSINGS

*Efficiently and Acceptably Protects the Public from Accident.*

By an unmistakable warning of the approach of every train, of such vigor as to arouse the attention of the most unwary. Acts only by approach of train or engine. Gives no false alarms. Obviates employment of Watchmen at great saving in expense.

### Makes Its Own Electricity,



Only as required, by passage of train over track levers of substantial Magneto Generators fitted in strong iron cases alongside the tracks and at required distance from crossing. As no cup batteries are used there is no freezing up in winter, nor running out of battery power. Action of Alarm incomparably better, quicker and louder than any other electric signal.

Requires only lubrication, and some little attention to condition of working parts at intervals.

## *ELECTRIC SEMAPHORE SIGNALS.*

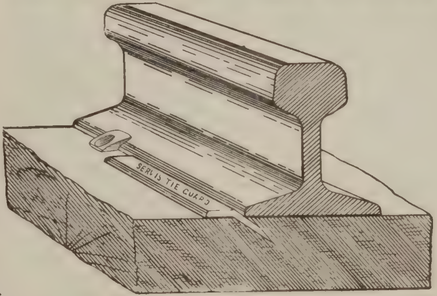
Operate at any required distance under eight miles with certainty and precision. Useful at all points where trains are to be signalled and controlled from a distance. Movement of signal affected by currents from magneto machines, which will operate any required number of Semaphores from the one station. Action of each Semaphore always known to operator however distant. Semaphore is full size, mounted out doors on regular posts. Valuable addition to the signals of any station, and especially useful at junctions or other points where trains arrive from various directions.

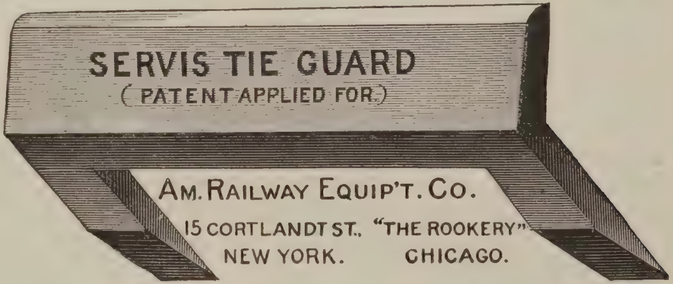
For particulars and prices of Frogs, Switches and Signals,

Address **GEO. W. PARSONS,**

**STEELTON, PA.** SUPT. F. S. & S. DEPT.

# THE SERVIS TIE GUARD





The Servis Tie Guard is a track device for the purpose of preventing the rail from canting and sinking into tie.

Referring to the cuts, the sharpened prongs are driven into the tie close to the rail, and when driven home the under side of the tie guard is seated on the tie, and the edge of the rail base rests on the bevelled part of the tie guard.

The tie guards are intended to be driven on both sides of the rail. They are four inches long, and when properly driven, make the tie for that length, practically a metal faced tie.

By preventing the rail from cutting into the tie, the tie guard fortifies the spike inasmuch as it prevents the the rail from lifting or hammering the spike. Tie guards are driven after the rail is spiked down, without disturbing the rail. Any trackman can drive them properly and easily with an ordinary maul.

The use of these guards on several prominent roads has fully demonstrated their utility.

*15 Courtland St.,*
*NEW YORK.*

## The American Railway Equipment Co.,

*"The Rookery,"*
*CHICAGO*

**MANUFACTURERS OF SERVIS' BRACE-HEAD SPIKES AND SERVIS' PERFECT NUT LOCK.**

. . . THE . . .

# WEIR FROG CO.

HAVE THE LARGEST CAPACITY FOR

# TRACK SUPPLIES

West of the Alleghany Mountains.

☞ Note carefully the following pages. ☜

# THE WEIR FROG CO.

Manufacturers of the Most Complete Line of

## TRACK SUPPLIES.

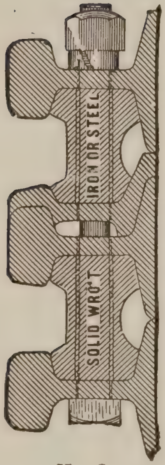
And have the largest capacity of any similar concern West of the Alleghany Mountains.

*Works: Front, Smith and Water Sts.,*
*CINCINNATI, OHIO.*

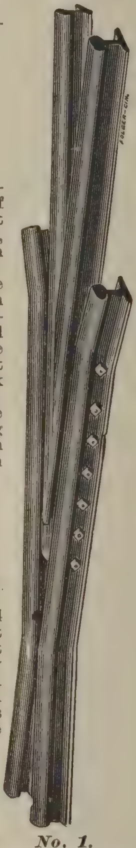
In the list of their manufactures may be mentioned Six Styles of Rigid Frogs, Eight Styles of Spring Frogs, the well-known Clarke-Jeffery Split Switch with F. C. Weir's Improvements, Crossings, etc., illustrations of a few of which are shown herewith.

First, we desire to call the attention of the Roadmasters to our Rigid Frog, which is shown in cut, and Cross Sections, Cuts 1 and 2, Cross Sections of which show our Specially Rolled Solid Steel or Wrought Iron Filling process. These Frogs are secured with ⅞ through bolts, the widest National Lock Washer Co,'s Nut Locks, and Hex Nuts making a very strong and durable job.

There having been some discussion as to the merits of the different methods of constructing points of frogs, we have concluded to show them all up, believing there will be but one conclusion by the level-headed, practical trackmen.

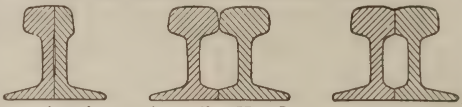


*No. 2.*

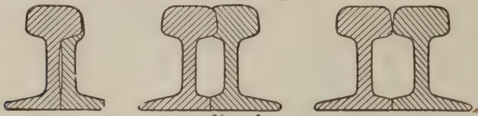


*No. 1.*

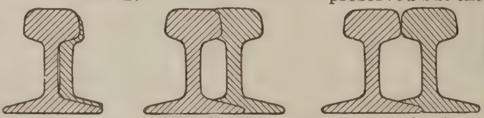
Cut Cross Section No. 3 shows original method of making points of frogs by notching the main point rail to receive short point rail.



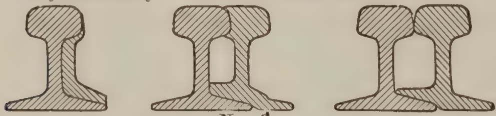
*No. 3.*



*No. 4.*



*No. 5.*



*No. 6.*

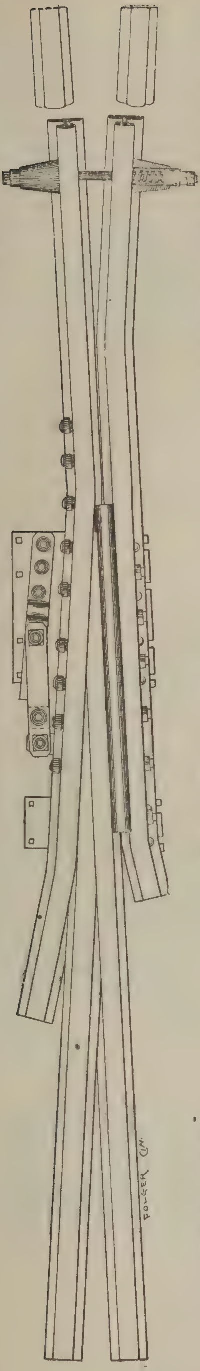
Cut No. 4 shows the first improvement on this by which the head of the main point rail was preserved but the base weakened. Cut No. 5 shows the full strength of the main point rail preserved, but at the cost of very materially weakening the short point rail, so that it has a very slim vertical support. Cut No. 6 shows the latest improvement, which is the WEIR system, manufactured and controlled exclusively by us. This is what we term our Dieformed Short Point. By this method we not only save the full strength of the main point rail, but more of the original strength of the short point rail, and produce a stronger construction of the point rails generally.

These cross section cuts are fair illustrations photographed down from full-sized drawings, therefore they can be unhesitatingly accepted as correct.

# THE WEIR FROG CO.

Cut No. 7 shows plans of one of our designs of Spring Frogs on Steel Plates. In this style of Frog we use a bent arm, one end riveted to the Steel Plate, and the other end acting as a holding down device in connection with the double links which connect this Arm to the movable Wing Rail. We know of no other device which resists the tendency of the Spring Wing Rail to creep, and at the same time produces so little friction in the parts as this device does.

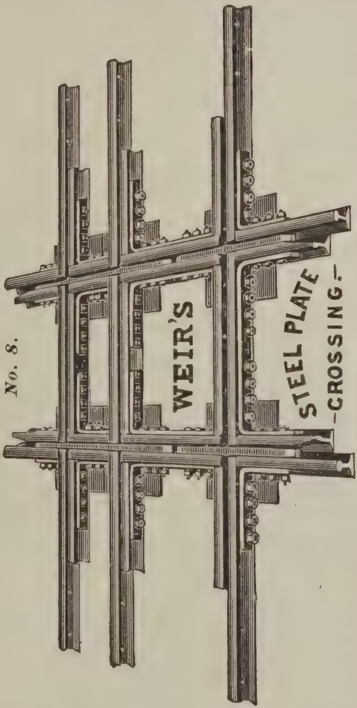
The heavy protection Bar, it will be observed, is secured to the web of the rail with ¾ Bolts either way from the extreme point of the Frog, and this insures the holding together of the Rail in the event of its being broken, and thereby avoiding an accident. For the above reasons we believe this to be the most efficient and durable Spring Frog in the market.



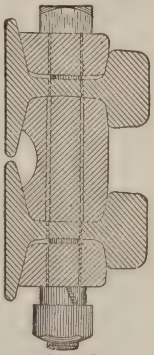
*No. 7.*

Standard Spring Frog, Design No. 2.

Besides this we are making five other designs, some lower priced and some more expensive, but we feel confident we can suit any one, no matter what his ideas are, Blue Prints of these different designs will be furnished on application.



*No. 8.*



*No. 9.*

Our crossings made with specially rolled Solid Wrought Iron or Steel Filling as shown by Cut No. 8, and Cross Section No. 9 are very extensively used.

These Crossings are secured with specially rolled very heavy Wrought Iron Bars, which with the use of eight or more through Bolts ⅞ of an inch in diameter, Hex Nuts, the Widest National Lock Washer Company's Nut Lock, produce the strongest and most durable structure possible ; and being supported on Steel Plates at each corner the durability of not only the Crossing, but also the Ties are assured without impairing the elasticity.

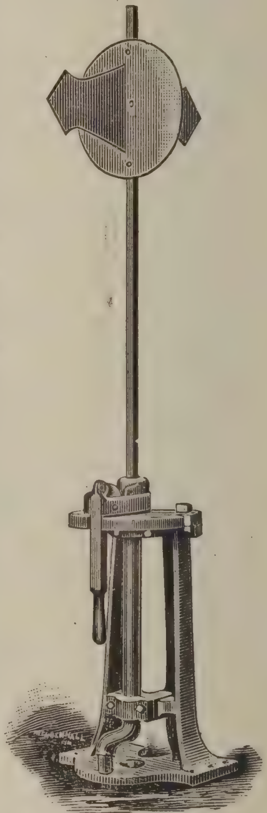
We show our patent Three-throw Split Switch with patented Low Target Ground Throw Stand by cut No. 10. This Switch presents may new and valuable features, and in Yards when Three-Throw Switches are sometimes a necessity, we can especially recommend it as being safer, more durable, and easier on the rolling stock than any Switch now in use. The stand which throws the switch by means of a single lever, is the only Low Target Ground Throw Stand for Three Throw Split Switches in the market, and as a Ground Throw Stand is desirable in Yards, we feel that we have a Stand especially adapted to the purpose. The fastenings which connect the Rails and Bars are same as those used in our Single Split Switches, *i. e.*, Steel and Die Formed. They come nearer an absolutely unbreakable fastening than any now in use. The opening through which the Bar passes is large enough to permit considerable lateral movement of the Bar, which allows the Switch Rails to move more freely.

Our Steel combined Brace and Friction Plates used with these have no equal, as they are indestructible and we alone have the right to furnish them. All of the Friction Plates of this Switch are Steel, and all of them pass through under both Main Track and Split point rails, so that an equal bearing is always insured on both the Main Track Rail and Friction Plates.

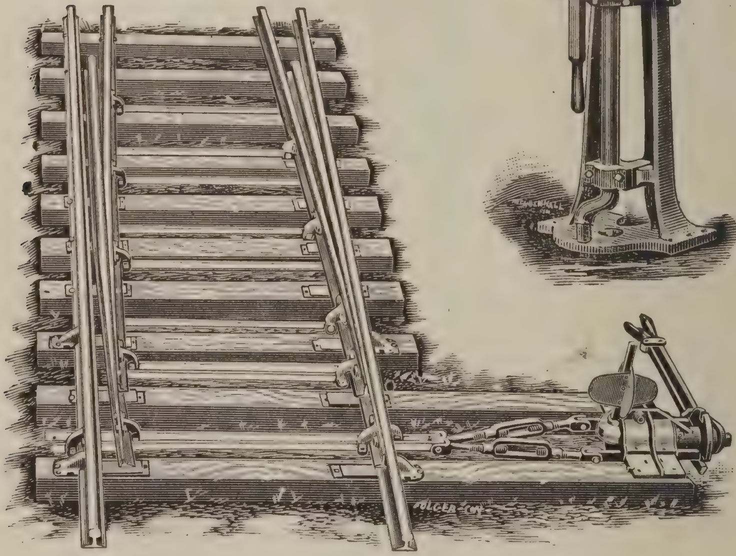
Our capacity for furnishing these Switches is practically unlimited.

Our High Switch Stand, shown on cut No. 11 is what we term our Union Pacific Pattern; possesses the merit of not permitting tampering with the Connecting Rod when it is once put on its place and the Crank Shaft bolted up, as the Bottum Plate under the stand prevents removal. The Locking Device in the Lever Casting at the top of the Stand is very simple and very effective as will be seen by the cut. We make this pattern that we term High Stand, and also a Pony Stand, which is not more than half its height, with any style of Target as desired.

***No. 11.***



***No. 10.***



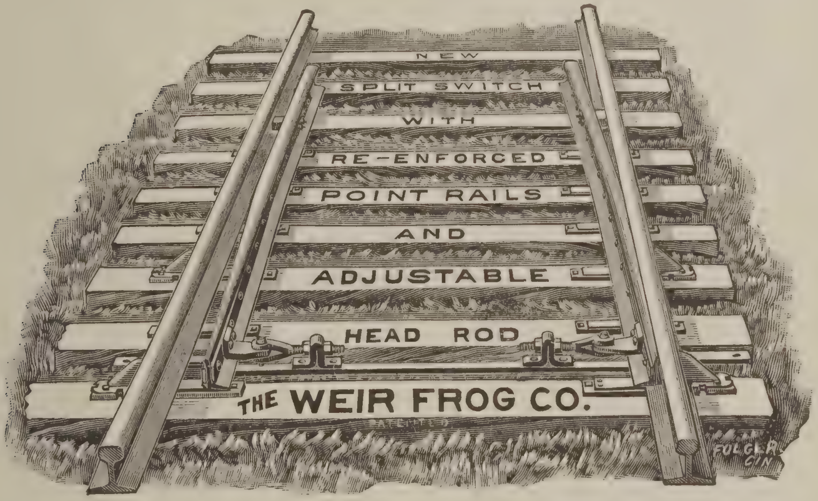
We show by Cuts No. 12, 13 and 14, our latest improvement of the Split Switch, which we style Adjustable Single Bar Split Switch with Re-enforced points. As will be seen by plan and section, we use but the head rod for this Switch (doing away with the other three rods) and by means of threaded fork and nuts on same, can at all times keep points adjusted to proper throw, and tight up against stock rail. It will be noticed that we re-enforce the point rails on each side by forged iron bars of best quality, shaped to fit web of rails, full length of Switch rails, so that in case of breakage of points, the re-enforcement will hold broken points in place until change can be made, thus preventing any possibility of derailment.

Roadmasters will appreciate the adjustable feature of this Switch, owing to the trouble experienced in keeping points at proper throw by present methods.

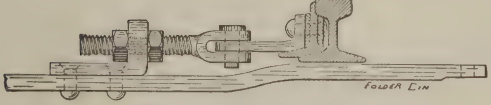
The use of but one bar is the regular practice on first-class English Railways, but theirs are not adjustable, neither have they the safety feature that ours have with the re-enforcing Bars.

We have also another design of this Switch, but owing to the limited time allowed us, we are unable to get up a cut of it to illustrate here. Would be pleased though, to send a blue print of same on application.

*No. 12.*

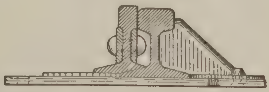


*No. 13.*



ELEVATION OF HEAD ROD.
SHOWING ADJUSTING DEVICE.

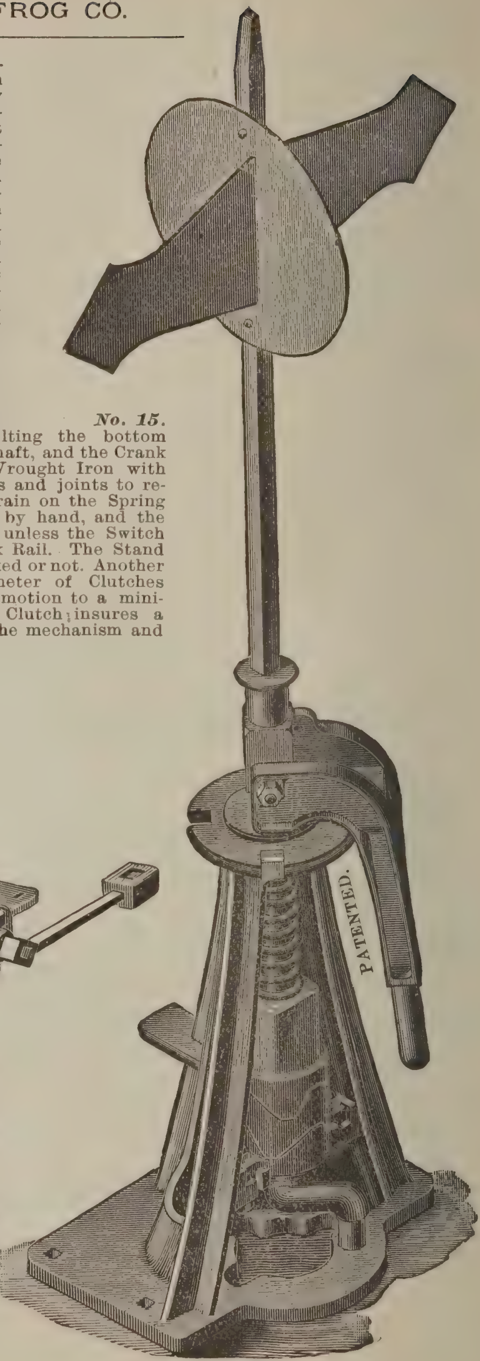
*No. 14.*



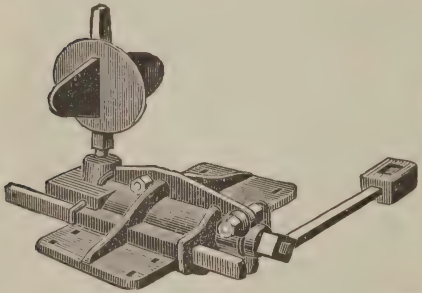
SECTION SHOWING STEEL RAIL BRACES & RE-ENFORCING BAR.

Fig 15 shows our High Automatic Switch Stand which possesses some entirely new features, the most conspicuous being the Three-part Clutch having faces of different inclinations. By the use of this we are able to furnish a Stand which offers less resistance when the Switch Rail is being forced open, and at the same time closes the point Rail tighter than with any other form of Automatic Clutch Stand. Besides the advantage of using a Three-part Clutch there are one or two others worth mentioning. The Stand can be used on either one or two ties and the Target Shaft can be turned to suit the track. The Connecting Rod cannot be taken off the Crank without unbolting the bottom bearing and lift the Crank Shaft, and the Crank and Shaft are one piece of Wrought Iron with long carefully fitted bearings and joints to reduce wear. There is no strain on the Spring when the Switch is thrown by hand, and the Handle cannot be dropped unless the Switch Rail is tight against the Stock Rail. The Stand is Automatic whether padlocked or not. Another advantage is the large diameter of Clutches which reduces possible lost motion to a minimum, and the Three-part Clutch insures a double life to this part of the mechanism and stand.

*No. 15.*



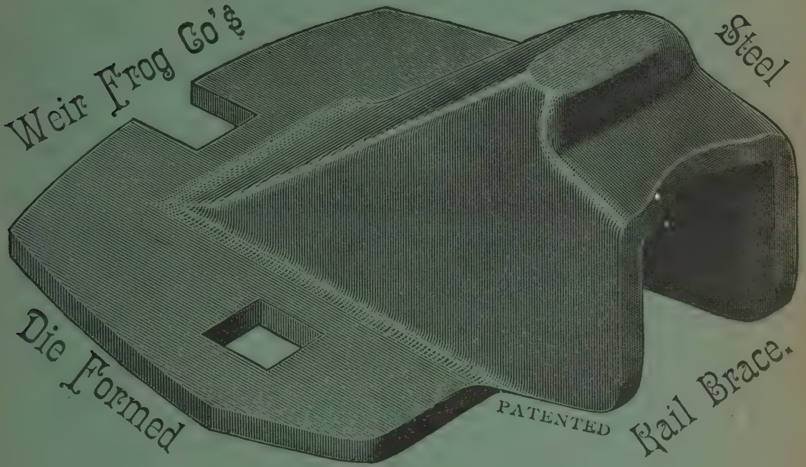
AUTOMATIC HIGH STAND.



*No. 16.*

We also have another Switch Stand that we term our Automatic Low Target. This is shown by cut No. 16. It is very positive in its motion, and a very durable Stand. It can be used with either Stub or Split Switch, but is automatic only with Split Switches, when trailing through them. We have furnished large numbers of these with excellent satisfaction.

# STEEL DIE FORMED RAIL BRACES.



*No. 17.*

We show by Fig. 17 one of the six designs of Steel Die Formed Rail Braces which we make. They are made of Homogeneous Steel Plate $\frac{1}{4}$ to $\frac{5}{16}$ inches thick as preferred, and are Die Formed to fit any section of Rail, and our Machinery built especially to manufacture these Braces, gives us a capacity of Twenty-four Thousand a Day. In making orders for

**Frogs, Switches, Crossings or Head Chairs,**

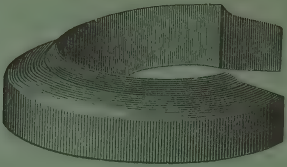
the section of Rail should be furnished, giving height, weight, distance of Fish Plate holes, gauge of Track, and angles of Frogs and Crossings. Blue Prints are requested for any or all of this work whenever they can be furnished. Promptness is guaranteed in filling orders as well as good workmanship. Estimates, also Lithographs and Photographs furnished on application. Address

**THE WEIR FROG COMPANY,**

**Front, Smith and Water Sts., - CINCINNATI, O.**

# THE NATIONAL

**The only**
**POSITIVE**
**Nut Lock**



**Combined**
**with**
**Spring Power.**

# LOCK WASHER!

---

**Seventy Million in use in Railroad Track.**

Combining **Strongest Spring Fastening** possible, with **Positive** locking of nut by **Rib**.

Made of best spring steel, hardened in oil and tempered. When nut is screwed up, Rib of Lock Washer upsets metal of nut, forcing it into and around thread of bolt, thus securely locking nut, at same time having all the spring holding power of best spring nut lock made.

Can be used on any make of bolt or nut in any place in track.

Same bolt, nut and Lock Washer can be used as *often as required.*

Its successful use for the past six years, and the steadily increasing demand, proves its superiority over all others.

Make a trial. Samples furnished free of expense.

---

## The National Lock Washer Co.

**Cor. Herman and Johnson Sts., NEWARK, N. J.**

PROPERTY
Civil Engineering Department
UNIVERSITY OF ILLINIOS

Please return to ENGINEERING HALL

Room No. ........ Case No. ........

Drawer No. ........ Drawing No. ........

# The New England

# Roadmasters' Association

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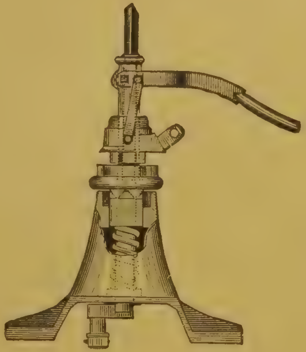
## Proceedings,—1893.

RAMAPO IRON WORKS

—MANUFACTURERS OF—

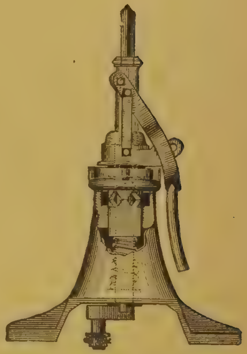


SAFETY SWITCHES,

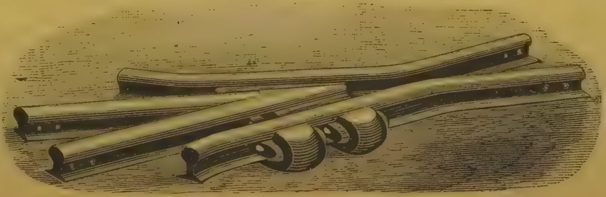
—AUTOMATIC—

*SAFETY SWITCH STANDS.*

**Office and Works, HILBURN, Rockland Co., N. Y.**



FROGS AND



CROSSINGS.

# PROCEEDINGS

OF THE

# Eleventh Annual Convention

OF THE

NEW ENGLAND

# Roadmasters' Association,

HELD AT THE

AMERICAN HOUSE, BOSTON, MASS.,

August 16th and 17th, 1893.

---

EDITED BY THE SECRETARY.

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NORTHAMPTON, MASS.:
PRESS OF GAZETTE PRINTING CO.
1893.

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*Vice President,*

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| J. W. McManama, | F. R. R., | Boston, Mass. |

The President. The Vice President.

The Secretary.

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# PROCEEDINGS.

The Eleventh Annual Convention of the New England Roadmasters' Association was held at the American House, Boston, Mass., on August 16th and 17th, 1893.

At 1.30 P. M., on Aug. 16th, the President, Mr. C. B. Lentell, called the members to order, and addressed them as follows:

President — Gentlemen, we are about to open our Eleventh Annual Convention. I am glad to see so many Roadmasters present. It shows the interest that you take in this Association. I am also glad to see so many supply men with us, with their devices to help us out in our work, and I hope that every member of this Association will examine those devices and express that recognition of their merits which they deserve. Gentlemen, I thank you for the honor which you conferred upon me in electing me your presiding officer; but, as I told you a year ago, I am no speechmaker, and I have therefore taken the liberty of writing a few words, which, with your permission, I will read to you.

The past year has been a varied and, in some instances, remarkable one for our Association. I do not suppose there has been a year since our organization in which so many changes have taken place among Roadmasters in New England. I think that no less that ten or twelve members of our Association have severed their connection with railroad work. Your Vice-President has resigned as roadmaster of the New York, New Haven and Hartford railroad, and the first member of the Executive Committee has also resigned from the Boston & Albany railroad. I mention those only because they were men elected by you to help look after the business of the Association for the past year. But, gentlemen, your Executive Committee have met and transacted such business as they thought was best for the Association, once at the Cooley House, Springfield, and twice at the American house, in Boston. Our Secretary has been untiring in his efforts to promote the prosperity of our Association during the year.

I will not tire you with extended remarks. We are now assembled together at this our Eleventh Annual Convention, to discuss the different ways of doing work and the various devices intended to help us out in that work. We have different questions to discuss. The first one on our list will, I think, be interesting to all, as it is one which affects every roadmaster, no matter how small his charge. We have with us a man of large experience in railroad material, who will address us this evening on rails, their manufacture and use, from the raw material to the scrap heap. I know his remarks will be interesting to all.

There is one other matter I wish to have brought up, that I think is of great importance to our Association, and that is the question of a change in, or addition to our by-laws, so that we will be in truth as well as in name, a Roadmasters' Association. As our by-laws now read, any member of our Association would still be an active member, even though he should sever his connection with a railroad and engage in any other business, and under those circumstances we could all be supply men or agents, and pass resolutions favoring our designs. I do not think there is any member who would do this, but according to our by-laws we have a perfect right to. Now we do not want to lose any of our members on account of severing their connection with a railroad, but we want to add to our roll, and we want our by-laws so changed that such persons may still retain their membership, and yet not be active members—honorary members would perhaps be the proper term. I simply throw out this suggestion in order that the members may see how we stand.

I am pleased, as I said before, to see so many present, and hope this convention will prove a benefit to us all, as well as to the railroads that we represent. I desire and expect that every member will do his part to make this convention a profitable as well as an interesting one.

Trusting that you will bear with me in any mistakes or omissions that I may make, I will close these remarks, and proceed to the usual order of business.

Mr. Secretary, you will please read the record of the last annual meeting.

The Secretary, Mr. G. L. R. French, of the Boston & Maine R. R., read the minutes of the Tenth Annual Convention, and also those of the meetings of the Executive Committee.

President—Gentlemen, you have heard the reading of the record of our previous and intervening meetings—are there any corrections to be made? If there are not, I shall and do declare them approved. The next thing in order is the report of the Secretary and Treasurer, to which we will now listen.

The Secretary and Treasurer submitted and read the following:

### SECRETARY'S VOUCHER AUG. 1892, TO AUG. 1893.

| | | |
|---|---|---|
| Cash received from assessments, | $112 00 | |
| " " " exhibitors, | 68 00 | |
| " " " sale of pamphlets, | 1 50 | |
| " " " advertisements, | 525 00 | |
| " " " members' subscriptions | 37 50 | |
| | | $744 00 |
| Cash paid for services and expenses of stenographer, | $81 30 | |
| " " printing pamphlets, | 299 66 | |
| " " printing notices, | 2 67 | |
| " " postage, | 11 62 | |
| " " stamped wrappers, | 32 70 | |
| " " clerical assistance, | 10 00 | |
| " " Cooley House dinner, | 137 50 | |
| " " second-hand type writer, | 54 00 | |
| " " stationery, | 1 95 | |
| " " telegrams, | 1 55 | |
| " " Secretary's salary, | 75 00 | |
| " " help at Cooley House, | 3 00 | |
| " " express and cartage, | 2 99 | |
| " " treasurer, | 30 06 | |
| | | $744 00 |

G. L. R. French, Secretary.

## TREASURER'S REPORT.

| | |
|---|---|
| Cash on hand Aug. 1892, | $272 20 |
| " rec'd from Secretary as per voucher, | 30 06 |
| " on hand Aug. 1893, | $302 26 |

G. L. R. French, Treasurer.

President—Gentlemen, you have heard the report of the Secretary and Treasurer—what is it your pleasure to do with it?

Mr. Patch—I move that we accept the report of the Secretary and Treasurer.

The motion was duly seconded and carried.

President—The Secretary will please call the roll.

The roll was then called, and the † before names in the list of members at the end of book indicates those present.

President—Are there any applications for membership, Mr. Secretary?

Mr. French—I understand there are several applicants. I have application blanks, but have only received one filled out. I would like to have those members who know of candidates for membership supply these blanks to them, so that they may be filled out at once.

President—We will pass this order of enrollment of new members temporarily, and proceed with some other business until the blanks are filled out and presented. Mr. Secretary, are there any communications to be read?

Mr. French—The only communication of interest is one from Mr. Dudley, saying: "Your very kind invitation of the 9th to address your Association on the 16th or 17th of August, at hand. In reply would say I take great pleasure in accepting, and shall make every effort possible to fulfill the engagement. At your pleasure I will read a paper on steel rails, their manufacture and service, treating briefly of all the steps in the process, from the pig iron to the perfect rail in the track." We all know that Mr. Dudley has been able to arrange his engagements so as to be with and address us this evening. Then there are a lot of notices, whereby superintendents have given permission to their roadmasters to be present here, showing the standing our Association has, and how gladly superintendents or managers will give us two or three days in a year in order that we may discuss these questions. Here is one to a roadmaster who is present, granting him leave of absence to attend the Roadmasters' Convention, and saying: "I cheerfully do so, with a desire to afford you needed recreation, and also because I know that the effect of consulting with so many practical road men will be beneficial to yourself and the company you represent. I will be pleased if you will extend the courtesy of this line to any who can spare time to visit it." L. L. Lincoln, Supt.

There are quite a number of others similar to this one.

President—Gentlemen, I don't see that there is any action necessary to be taken in regard to these communications. I suppose the reading of our Constitution and By-Laws should come in at this time, if they are to be read. What is your pleasure in regard to that ?

Mr. Patch—As there are some new roadmasters present, and some who intend to join the Association, I should think it would be well to have the By-Laws read.

President—If that is the wish of the Association the Secretary will read them.

The Secretary thereupon read the Constitution and By-Laws.

Mr. French—Mr. President, while we are reading and talking about the By-Laws, I think it would be a good time to consider their amendment, so that we need not waste any time in taking it up again. I move that we amend Article IV of our Constitution and By-Laws, by adding another section, to be called Section 5, and to read as follows: "Any member ceasing to be a roadmaster, or assistant roadmaster, or engineer of maintenance of way, shall at the same time become an honorary member of the Association, and shall enjoy all the privileges of active membership, with the exception of voting and holding office, and the further exception of the right to discuss on the floor except as called upon by the chairman."

Mr. Sibley—I second the motion.

The motion was carried, and the By-Laws declared amended in the manner stated.

President—The next order of business is the election of officers.

Mr. Bishop—Mr. President, as I recollect, the election of officers last year occupied about two hours. There were so many nominations that it was not an easy matter to determine who should be our officers. I would move that the chair appoint a nominating committee of three, who shall retire and present a list of officers to be elected at this meeting.

Mr. Patch—I second that motion.

The motion was carried, and the President appointed the following committee: G. W. Bishop of the F. R. R., John R. Patch of the C. R. R. R., and W. E. Clark of the V. V. R. R. The committee retired for deliberation.

President—While this committee is out we might take up the enrollment of new members. Mr. Secretary, have you any propositions on your table ?

Mr. French—I have one application here filled out and signed. The applicant is Mr. Frank H. Hyde, Assistant Roadmaster of the First Division of the B. & A. R. R.

President—Gentlemen, your hear the application of Mr. Frank H. Hyde, Assistant Roadmaster of the First Division of the B. & A. R. R. What action will you take in regard to it ?

On motion of Mr. Sibley, duly seconded, Mr. Hyde was elected a member of the Association.

Mr. French—Here are three more. One applicant is Mr. C. E. Bickford, who is employed as Roadmaster on the M. C. R. R., and in charge of the Quebec Division. Another one is Mr. H. J. Glynn, Assistant Roadmaster on the O. C. System, in charge of the Taunton Division. Another is Myron E. Drew, Assistant Roadmaster on the O.

C. R. R., in charge of the Second Cape Division. There are other blanks in circulation. If we could have them as soon as they are filled out, we could get through with this part of the business very quickly. Others have just come in. Another one is Mr. William E. Tuttle, Roadmaster on the N. Y., N. H. & H. R. R., in charge of the Northern Division. Another one is Mr. George K. Thornton, in charge of the Central Mass. Divison of the B. & M. R. R. Another one is Mr. F. E. Dodge, Roadmaster of the Montpelier & W. R. R. R.

President—Gentlemen, you have heard the application of Mr. C. E. Bickford of the M. C. R. R.—what action will you take in regard to it ?

Mr. French—Mr. President, I move that we admit all these gentlemen to membership on one vote.

The motion was seconded by Mr. Sibley and carried, and the following roadmasters were declared members of the Association : C. E. Bickford of the M. C. R. R.; George K. Thornton of the B. & M. R. R.; F. E. Dodge of the Montpelier & W. R. R. R.; W. E. Tuttle of the N. Y., N. H. & H. R. R.; H. J. Glynn of the O. C. R. R.; and Myron E. Drew of the O. C. R. R.

Mr. French—Mr. President, there was one more blank applied for, which is still in circulation. If we could have that additional application, so as to wind up this matter at this time, it would be an advantage. The other application has just been handed in. The applicant is Mr. Charles H. Jones, Roadmaster on the N. Y., N. H. & H. R. R., in charge of the First Cape Division.

President—Gentlemen, you hear the application of Charles H. Jones of the N. Y., N. H. & H. R. R.—what is your pleasure in regard to it ?

On motion of Mr. Stickney, duly seconded, Mr. Jones was admitted to membership in the Association.

Mr. French—Mr. T. J. Sullivan, Assistant Roadmaster on the B. & A. R. R. at Springfield—Roadmaster now—and Mr. R. McQuade, Roadmaster on the Western Division of the B. & A. R. R., have also sent in their applications for membership, to be acted upon at this meeting.

On motion, duly seconded, Mr. Sullivan and Mr. McQuade were admitted to membership in the Association.

Mr. French—Mr. President, as the time is passing rapidly and we have a few moments during which the regular order of business is suspended, I think we might take up the question of the place for holding our next convention.

President—Gentlemen, you hear the suggestion of our Secretary. I would like to have you express your preference concerning where you would meet next year, and it might be decided at this time.

The nominating committee here returned to the room.

Mr. Bishop—Mr. President, the committee appointed to present nominations for officers have prepared the following, and with a little explanation I will present them: G. L. R. French, President; R. P. Collins, Vice-President; E. E. Stone, Secretary; and the Executive Committee to consist of C. B. Lentell, F. E. Sibley, S. B. Bodwell and J. W. McManama. We find ourselves minus a Vice-President to elect as President, and we must all acknowledge that Mr. G. L. R. French has been of great service to this Association, and no doubt some time during his connection with it would like to be its President. I think we are unanimous that he should be. After we get in line again and have a Vice-President, it is a matter of courtesy that he should be brought forward at the next meeting and elected. We take this opportunity, while there is a break in the lines, to nominate Mr. French as President of this Association.

President—Gentlemen, your hear the report of your nominating committee—what action is it your pleasure to take regarding it?

Mr. Clark—Mr. President, I would move, if it is the wish of the Association and no one desires to bring forward any other names for the several positions, that the President appoint one man to cast a ballot for the entire list, I think it can be done unless there are objections made. I do this to hurry the business along, as we have quite a large amount of business to transact.

President—I am not posted enough to know whether that is legal or not. It seems to me that it would be all right to take up either one name or the whole. I am not familiar enough with parliamentary rules to know.

Mr. Clark—I think that if there are no objections it will work; if there are objections, I will withdraw my motion.

Mr. Braley—I second Mr. Clark's motion.

President—It has been moved and seconded that one member be appointed to cast a ballot for these names presented by our nominating committee as your officers for the coming year. Have you any remarks to make?

Mr. French—Mr. President, I understand by that that each officer is to be voted for separately. Is that the idea, Mr. Clark?—each officer is to be voted for by one ballot simply. For instance, the President is to be elected first, by one man casting a ballot for the Association.

Mr. Clark—Certainly, that is the idea.

Mr. French—Then for Vice-President?

Mr. Clark—That was what I intended.

Mr. Clark's motion was put and carried.

President—I will appoint Mr. Patch as the committee of one to cast the ballot of the Association for President for the coming year.

Mr. Patch—Gentlemen, I think we are all unanimous on this subject, and that Mr. French should be our next President; and for the members of this Association I will cast a vote for Mr. French as President—or do you wish that I should write it and pass it in?

President—Yes, sir.

Mr. Patch thereupon cast a ballot for President, and the President announced that Mr. G. L. R. French of the B. & M. R. R., has been elected to that office for the coming year.

President—Mr. R. P. Collins of the N. Y., N. H. & H. R. R., has been nominated as your Vice-President. I will appoint Mr. J. W. Drew to cast the ballot as the sense of this convention.

Mr. J. W. Drew thereupon cast a ballot for Vice-President, and the President announced that Mr. Collins had been elected Vice-President for the ensuing year.

President—Mr. E. E. Stone has been nominated Secretary and Treasurer for the coming year. I will appoint Mr. Sibley of the N. Y., N. H. & H. R. R., to cast the ballot.

Mr. Sibley thereupon cast a ballot for Secretary and Treasurer, and the President announced that Mr. E. E. Stone of the B. &. A. R. R., has been elected Secretary and Treasurer for the ensuing year.

President—Now, do I understand that you wish to have the Executive Committee elected on one ballot or separately ?

Mr. French—I think it would be well to have all four elected on one ballot.

President—The nominating committee have nominated for the Executive Committee, C. B. Lentell, F. E. Sibley, S. B. Bodwell and J. W. McManama. I will appoint Mr. Patch to cast the vote, as the sense of this convention, for the Executive Committee.

Mr. Patch thereupon cast one ballot for the Executive Committee, and the President announced that C. B. Lentell of the B. & A. R. R., F. E. Sibley of the N. Y., N. H. & H. R. R., S. B. Bodwell of the B. & M. R. R., and J. W. McManama of the F. R. R., had been elected, and would in conjunction with the newly elected officers, constitute the Executive Committee for the coming year.

President—The next order of business is to receive reports of committees. The first question to be reported on is : "Best method of relaying rail in main track ; details to be observed for insurance of safety and economy ; proper handling of rail before placing in track, and care of same immediately after it is laid in track." Committee, George W. Bishop, E. E. Stone and J. R. Patch. Is Mr. Bishop. the chairman of the committee, ready to report?

Mr. Bishop—The committee appointed to report on the best method of relaying rails in main track, respectfully submit the following:

We recommend that all rails be carefully unloaded so that the same will not become notched in web or crooked in line or surface. That all rails to be used on curves to exceed two degrees should be curved with some machine appropriate to that use, and not with sledges or hammers. That rails should be bolted together on ends of ties ready for use in as long sections as time will permit of laying same between trains. That all adzing, spike pulling and loosening of bolts in old track, which can safely be done, should be accomplished before relaying begins. That the foreman in charge shall arrange with train dispatcher if convenient to any office to perform such work at times when it will least interfere with the movement of trains, and relay the longest sections of rails possible that can be properly taken care of. That when old rails are removed from track, old ties should be smoothed off level with adzes before new rails are replaced. That new rails be safely spiked to gauge, and loose ties either tamped or shimmed to surface before trains be allowed to use same. That old ties be properly spaced off, that old joint ties and ties badly decayed be removed and replaced with new ties. That all tracks relaid should be surfaced with level board and properly lined before the ballast should be smoothed off, after which all bolts should be kept thoroughly tightened.

### TEN QUESTIONS PERTINENT TO MAIN QUESTION.

1st. Should new ties be used under all new joints or old ties allowed to remain under same?

2d. Should old spike holes in good ties be plugged or remain open?

3d. Should all track relaid be raised enough to allow all ties to be tamped with tamping bars?

4th. What is the maximum degree of curve rails should be laid on without being curved before laid in track?

5th. Is it necessary when the track is raised one inch, to tamp every tie inside and outside with tamping bars?

6th. Is it economy to turn old ties bottom side up that have not been in track more than two years?

7th. What number of men would be considered most economical to have in said gangs ?
8th. Would you recommend special gangs or add extra men to regular gangs for relaying rails ?
9th. How would you govern the subject of expansion, and how much to be used ?
10th. What position should outside and inside spikes occupy in same ties ?

GEO. W. BISHOP, F. R. R.
E. E. STONE, B. & A. R. R.
J. R. PATCH, B. & M. R. R.

President—Gentlemen, you have heard the report of your committee on the first question—what is it your pleasure to do with it ?

Mr. Clark—I move that we make the usual disposition of the report, that is, accept it and lay it on the table to be taken up later for discussion.

The motion was duly seconded by Mr. Sibley and carried.

President — Your second question is : "Comparative merits of spring rail and stiff rail frogs, when each kind is properly and thoroughly made." The committee consists of Mr. Collins, Mr. Torr and Mr. Drew. Is the committee ready to report ?

Mr. Collins—The committee appointed to report on "the comparative merits of spring rail and stiff rail frogs, when each kind is properly and thoroughly made," submit the following :

We present as points of merit in favor of the spring rail frog :
First, durability ; second, smoothness of riding to passing trains on account of its continuous rail ; third, remaining to better surface.
In favor of stiff rail frogs :
First, in case of broken wing rail it being more safely secured ; second, better resistance to the action of double flange of worn wheel tires, especially those of the driving wheels. We also present the following questions pertinent to the main question :
1st. Which is the cheaper to maintain during the winter ?
2d. Relative expense of mechanical repairs ?
3d. Relative liability of snow and ice causing trouble ?

4th. Relative life of frog timbers?

5th. Relative cost of repairs to rolling stock whether spring or stiff frog used?

6th. What should be the difference in per cent. of traffic of the two tracks to warrant using of the spring rail frog?

7th. Is it advisable to use the spring rail frog at a junction of a branch with main line tracks, where both are used for passage tracks, but where there are many express trains on the main line?

8th. Which should be used where the frog is on outside of curve of main line?

9th. Where is the most advantage in the use of spring rail frog for main line; in a trailing or facing point connection?

10th. All points of merit considered, what is the relative factor of safety?

All of the above is respectfully submitted,

R. P. Collins, O. C. R. R.
J. M. Torr, N. Y., N. H. & H. R. R.
J. W. Drew, O. C. R. R.

President—Gentlemen, you hear the report of your committee on the second question—what is your pleasure in regard to it?

Mr. Bishop—Mr. President, I move that it be accepted and laid on the table, to be taken up at some future time for discussion.

The motion was duly seconded by Mr. Patch and carried.

President—Your third question is: "Care of station grounds. Under whose direction should work on same be done, and the responsibility for the appearance of the grounds rest?" Your committee on this question is W. E. Clark, J. L. Shanks and J. W. McManama. Is the committee ready to report?

Mr. Clark—The committee appointed to submit a report on "Care of station grounds," present the following:

We recommend that station grounds be in charge of a man especially appointed for the work by the superintendent or roadmaster, and responsible to the one or the other, as may be.

We present these questions :
1st. What provision shall be made for the care of station litter, ashes, waste, etc ?
2d. What for the locomotive waste, ashes, etc ?
3d. What for passenger car litter ?

W. E. Clark, B. & M. R. R.
J. W. McManama, F. R. R.

President—Gentlemen, you hear the report of your committee on the third question—what is your pleasure respecting it ?

Mr. Bishop—Mr. President, I would move that this report be accepted and laid upon the table, to be taken up later for discussion.

The motion was duly seconded by Mr. Patch and carried.

President—The fourth question is: "Importance of railroads owning good gravel pits ; economy of using good ballast in roadbed maintenance ; best and most economical method of loading and unloading ballast." Your committee appointed on this question is Mr. J. W. Shanks, Mr. S. Greer and Mr. W. Hutchinson. Are you ready to report, Mr. Greer ?

Mr. Greer—Mr. President, the committee have not yet succeeded in preparing a report, and they would like to have a little further time to do so.

President—I would like to ask whether if you had a little further time you could prepare the report this afternoon, so that we could take it up to-morrow ?

Mr. Greer—That is our aim.

President—Gentlemen, if there is no objection we will give this committee further time to make its report. Mr. Secretary, is there any unfinished business to attend to ?

Mr. French—Mr. President, I know of no unfinished business, and would suggest that we take up the first question for discussion. Instead of beginning the discussion at once, inasmuch as we have got to know about our entertainment for to-morrow afternoon before six o'clock to-night, I should like to hear from the entertainment committee. Possibly they have already conferred with the supply people regarding the joint entertainment, and perhaps they have not been able to do that. If not, it might be well for them to retire and confer with the supply men, and come in and report to the Association what it is best to do for entertainment to-morrow afternoon.

President—I would like to ask if Mr. Bodwell is in the room ? Mr. Bodwell, are you ready to make a report in regard to the entertainment to-morrow afternoon ?

Mr. Bodwell—Mr. President, as I understand, we were to get together between five and six o'clock and talk the matter over and decide what it was best to do.

President—I don't see but what a report made previous to adjournment this afternoon would do.

Mr. French—All we want is to have an understanding previous to between half past five and six o'clock, so that we can notify the parties with whom we have talked, in regard to a trip down the harbor. It is simply a question, as I understand it, of providing a way. It is the wish and general opinion of both supply men and roadmasters that we should go down the harbor. Mr. Bodwell, as chairman of the entertainment committee, has brought forward the idea of chartering a boat, so that we would be the only people on board. Others have favored the plan of going down on one of the regular harbor pleasure boats. I went down with Mr. Bodwell to see the boat which he had in mind. It is a very nice boat, very neat, and about ninety feet long. It is really a tugboat with an awning over the rear and one over the bow. There is room in the wheelhouse, which is on the upper deck, for eight or ten ladies, but probably some of the ladies are a little timid about going down the harbor in a boat that is so near the surface of the water, and would much prefer going in a regular two or three-deck pleasure boat, one of those large pleasure boats; there are lots of them in the harbor, and I understand that the entertainment committee are going to confer with the supply men on that point, whether we shall have a boat of our own. But it strikes me that we ought to abandon that idea, because if two or three, or even one, of the ladies should be timid about going, it would impair the pleasure of all. I think perhaps it would be well for the entertainment committee to talk it over a little amongst themselves now, and if they think best see the supply men, and have the question decided as early as possible, and presented to us before adjournment.

President—If there are no objections and no obstacles in the way, I would like to have that committee meet the supply men, and make a report as soon as convenient this afternoon. If it is not possible, of course we will defer it until a little later. Is there any other unfinished business to come up, Mr. Secretary?

Mr. French—The following communication has just been handed to me:

Boston, Aug. 16th, 1893.

New England Roadmasters' Association,
American House, Boston.

*Gentlemen*:—As the electric street welder is now in operation on Shawmut Avenue, welding the ends of the West End Street Railway into continuous lengths, it occurs to me that it might be of interest to you to witness its operations. If you can arrange to do this to-morrow and will kindly state the hour to bearer, a representative of the Company will meet you at the American House and conduct you to the point where the machine is now working. Will you kindly advise me?

Yours truly,
Thompson Electric Welding Co.,
H. A. Royce, Gen. Manager.

President—Gentlemen, you hear this communication from Mr. Royce, what will you do in regard to it?

Mr. French—Mr. President, generally we have three sessions to our convention, the afternoon of the first day, the evening of the first day, and the forenoon of the second day, extending sometimes into the afternoon to perhaps three o'clock. This year we are to be cut short. You know it is for the interests of the Association to keep up to the standard as far as our pamphlet goes. In order to have a good pamphlet which will make it profitable for advertisers to advertise in it, we must have interesting reading matter, something that the roadmasters, superintendents and chief engineers will look forward to for ideas. This evening we devote to a lecture or address by Mr. Dudley, so that really we have only a few hours this afternoon and a few to-morrow forenoon for those discussions which make up our regular pamphlet. So although we should enjoy it, and find it instructive, it would take two or three hours to go out on Shawmut Avenue, and I don't see how we can afford the time to do it. We have got to have some good, long discussions, or else we fail to make a pamphlet. It is of the utmost importance to have a good annual pamphlet. Therefore I move that we adopt a resolution, as the sense of this convention, that owing to our limited time we will be unable to accept the kind offer of General Manager Royce, and that we tender to him the thanks of the Association for his kind invitation. Mr. President, while I want to keep that motion in force, I will state that the representative of Mr. Royce says that if any of us individually desire to see this—and some may have a strong desire to—Mr. Royce will give his personal attention to any one of our members who cares to go, any time to-morrow. Some who cannot go on our excursion would perhaps like to run up there while in the city. It is a new thing, and we would all like to see it, but owing to our very limited time we cannot.

Mr. Sibley—I would like to inquire at what hour the welding machine is at work.

Mr. Royce's messenger—All day, from seven o'clock in the morning until six o'clock in the evening. It would be well to notify the office first.

President—Is the motion of our Secretary seconded ?

The motion was duly seconded and carried.

President—Is there any other business, Mr. Secretary ?

Mr. French—There is no other business at present. I move that we begin now our work by taking up the first question and opening the discussion on it.

The motion was duly seconded.

President—It has been moved and seconded that we begin our work by opening the discussion on our first question, which reads as follows: "Best method of relaying rail in main track; details to be observed for insurance of safety and economy; proper handling of rail before placing in track, and care of same immediately after it is laid in the track." There are ten questions pertinent to the main question: 1. Should new ties be used under all new joints, or old ties allowed to remain under same. 2. Should old spike holes in good ties be plugged or remain open? 3. Should all track relaid be raised enough to allow all ties to be tamped with tamping bars? 4. What is the maximum degree of a curve rails should be laid on without being curved before being laid in track? 5. Is it necessary when the track is raised one inch to tamp every tie inside and outside with tamping bars? 6. Is it economy to turn old ties bottom side up that have not been in track more than two years? 7. What number of men would be considered most economical to have in said gangs? 8. Would recommend special gangs or add extra men to regular gangs for relaying rails? 9. How would you govern the subject of expansion, and how much is to be used? 10. What position should outside and inside spikes occupy in same ties?

## RELAYING RAIL IN MAIN TRACK.

President — Gentlemen, the question is before you for discussion.

Mr. French — Mr. President, to start the ball rolling I would suggest that you call upon one of our members to give his way and experience in laying new rail.

President—I would rather the members would speak voluntarily. I don't want to be obliged to call on them, and I hope and expect each member will have something to say. But as the suggestion is offered, I will call on one man who has had a large experience in laying rails, Mr. R. P. Collins, of the New York, New Haven & Hartford road.

Mr. Collins — Mr. President, your report covers a good deal of the ground which we all thoroughly believe in. The first point is, care in unloading by the men handling the rails. A few careless men will do much mischief in unloading rails. I would have an extra gang, made up from section gangs, for doing that work. If we are unloading in the winter I would recommend unloading by skidding them off, not throwing them off; but when the ground is soft, with a good deal of care the men perhaps can drop the rails off without bending them. When we are about ready to lay our rails I should recommend that each rail be placed on two ties that are perfectly level, to see whether that rail is perfectly straight, or if for a curve to have it in readiness to be curved. If for a curve I would strongly recommend the use of some bending machine. I myself have used sledges and hammers, but don't really believe in that method. I have resorted to it because we did not have a rail bender handy. There is no question in my mind but what in some of our broken rails the first fracture has started at the place where the hammer has been used. If the hammer must be used, by all means use a soft hammer, and do not allow a steel-faced hammer to be used in any instance. If we are laying our rails with a square joint I should say curve the rails for a one-degree curve; if we are laying broken joints perhaps two degrees would be low enough to go. When laying broken joints, or joints in the centres, one rail seems to pull on the other, and does not require so much curving. One question that the committee ask is, "Would you recommend the old spike holes to be plugged?" I should plug them, to preserve the life of the tie, which it certainly does, by keeping the water from it, and it also adds much strength where we wish it. If our ties are in good, sound condition, and of good size, I would not recommend that all joints be made of new ties, but rather the utilizing of the one that has already made a bed. Of course no matter what joint we use, the joint is the weakest part of the rail, and a new tie is certainly weaker than one that has a proper bearing. In regard to the position of spikes, I find that we have very favorable results if the spikes inside of the rails are on the same edge of the tie, and of course those on the outside on the opposite edge. It has a tendency to prevent the tie from sluing around, holds it better. As to the sixth question, "Is it economy to turn old ties bottom side up that have not been in track more than two years?" I should, with my experience, hardly want to recommend that. It seems to me that the labor could be put to better use. In turning ties over we disturb our bed, and if we do that I should say, "Give us new ties." In regard to getting rail ready and relaying, I would strongly recommend a special gang of sixteen men to get the rail and sleepers ready; and of course when we are ready to lay the track then call for the section men, and expect each section gang to help take care of what is laid on their section; but give them additional help that they may get the new rail in first class condition as soon as possible. In regard to expansion, it has been my custom, and a lesson that I have learned thoroughly from Mr. Drew, to be very particular with the expansion, to use an iron shim and not trust to wood at all. We use an iron shim of three-sixteenths, using one in each joint; and on a cold day we double shim every third or fourth, if in our judgment it is called for, on a warm day not so much. If we are laying track when the temperature is seventy or eighty degrees in a hot sun, of course it would not be necessary, perhaps, to shim each joint. I will not take up any more of your time just now, but would be pleased to hear from some of our older members. I merely make these few remarks to draw some one out.

President — Gentlemen, I hope you will speak on this question voluntarily. If you do not I shall be apt to call upon you. Mr. Clark, we would like to hear your views on this question.

Mr. Clark—I agree with Mr. Collins pretty thoroughly, and if you will allow me to take that report I will give you my practice. As to unloading, of course we all agree on the point that rails should be carefully unloaded in the winter with skids, and in the summer time if the ground is soft and free from stones, dropping from the side I think is all right. As to curving machines, I think I can speak without cracking up any patented machine. There is only one machine that I consider fitted to curve rails with, and that is the roller bender. It is the only scientific way of curving a rail. Every other bender that I have seen puts a series of kinks and not a uniform curve in the rail. That is my way of looking at that part of it. Every rail that I put in a track goes through a roller bender. There is no patent on this, and anybody can make one that wishes to. Whether it is going on a tangent or on a curve it goes through that roller bender. As to bolting together on the ends of ties, I never have had occasion to do that. I have time enough between trains to lay them in singly. Of course the temperature governs the expansion and thickness of the shim. As to adzing, spike pulling and loosening bolts in old track before relaying begins — we have plenty of time on our line, so we don't have to arrange with the operator at all in regard to relaying; we can get an hour or two at a time, either in the forenoon or afternoon. "When old rails are removed from track, old ties should be smoothed off level with adzes before new rails are replaced." I should agree with that, and new rails safely spiked to gauge. I widen all curves above three degrees. I don't widen three-degree curves, but anything above that I widen from half an inch to three-quarters. I put all rails on curves so that they will lie without crowding over with the use of the track. I think you all know my views on that, as I have expressed them a great many times. In regard to new ties under the joints, I say if the old ties are solid and good, leave them. Spike holes should be plugged. I should prefer to raise my track and tamp with bars when relaying. This fourth question I have already spoken on—I think all rails should be curved. As to tamping all ties with the tamping bar inside and out, I think that depends upon the ballast a great deal. We have ballast that we cannot tamp with a shovel, so it would be necessary to tamp it with a bar. With the soft ballast that we have in different places I think a shovel would do very well. In regard to turning old ties bottom side up, I never thought that was an economical method, and never got good results from doing so. I should employ sixteen or seventeen men, and recommend a special gang. Spikes should occupy the same position that Mr. Collins speaks of, the two inside spikes on the same side of the tie, and the outside spikes on the opposite side. For this reason: You spike a broad tie in the opposite way and you can lift your track from the gravel and take your tie out without removing the spikes. The moment you move it a particle one side goes faster than the other, one end of the tie is carried ahead of the other, and it loosens up on your spike and gives perfect freedom for your track to travel through between your spikes; on the other hand, if you spike as Mr. Collins describes, the two inside spikes on one side and the two outside spikes on the opposite side of the tie, the moment the track runs it tightens up on the spike and prevents creeping. I think that covers the ground, as far as I can see by the report.

Mr. Patch--Mr. President, I would like to ask Mr. Clark one question. He says that he would recommend raising the track after he has put in new steel, so that all the ties can be tamped with a tamping bar. And then he says further that he would not take out all of the joint ties because they lie so solid in the ground, and you could not put new ties in that would be just as soild. Now if you are going to raise your track so that you can tamp it your joint ties will be just as loose if old ones, in my opinion, as if they were new ones.

Mr. Clark — Excuse me, Mr. Patch, I think that was not my language. I said if it was a perfectly good, solid tie, I would not remove it. If the tie was all right, I would not take it out for the sake of getting in a new tie there.

Mr. Patch — Do I understand you by a good, solid tie, lying solid on the ground?

Mr. Clark — No, I didn't mean that. I meant a solid, sound tie. There is quite a difference with us in ties.

President — I would like to ask Mr. Clark whether he would recommend curving on a one degree curve?

Mr. Clark — There would not be much use in curving that, but as the rails come from the mill every rail goes through the curving machine, and if there is any imperfection in it that can be discovered by the eye it is taken out. On a one-degree curve the curvature in a thirty foot rail would be so small that you could hardly perceive it; but if there is a kink of any kind in that rail, of course that is taken out on going through the machine. It the rail was apparently all right, I would not recommend curving for a one-degree curve.

Mr. Patch—I would like to ask Mr. Clark one more question: If there is a bend in the rail so slight that you cannot discover it with your eye, can you set your machine close enough to run the rail through and take out that kink that you cannot discover with your eye? I have used a roller rail bender a great deal, and I find that I cannot place my roller rail bender so that it will bend all the rails equally for the same curve. Some rails I have to give a quarter of a turn more on the nut to get the same curvature in them that I do in others.

Mr. Clark — That is very true. That is owing to the hardness of the metal in the rail. Any imperfection that I could not see with my eye I should not know was there.

Mr. Patch — You say you put the rail bender, do you, on to every rail?

Mr. Clark—Every rail.

Mr. Patch — If you cannot discover any imperfection in the line of that rail, would you put your machine on to it?

Mr. Clark — Not at all. I never have found such rails.

President — I want to ask Mr. Clark one other question; What method he uses for checking the rails, keeping them from what we call creeping or running. This is a point that don't seem to be brought out.

Mr. Clark—Well, that is something that I would like to find out, what the best way is. But I will tell you what I have done, and done successfully. I have put an additional fish plate opposite the joint in the middle of the rail, drilled the rail in the middle and put the additional fish plate or angle plate right opposite the joint. That would give two ties in the center of the rail on the opposite track.

President—That would be with a suspended joint?

Mr. Clark — Yes, with a suspended joint, where the joints were broken.

Mr. Patch — Mr. President, he says, I think, if I understood him rightly, that he uses angle bars and fish bars for the centre of his rail. Did you not?

Mr. Clark —Angle bars or fish bars, they are the same, as I understand.

Mr. Patch — I would like to know with a fish bar how you are going to hold your rail from running. I don't see anything in a common fish plate that will prevent a rail running.

Mr. Clark—Mr. Patch does not understand the fish plate, probably, as I do. A fish plate is any joint, either the angle or the plate, anything to hold two ends of a rail together is a fish plate, and I use an angle plate, of course.

Mr. Patch—Then you don't use a fish plate?

Mr. Clark—I don't use a plain fish plate.

Mr. Patch—That is what I wanted to find out, because I didn't see anything in a common fish plate that I could fasten to hold the rail from running.

Mr. Sibley—I would like to ask Mr. Clark if he has found it necessary to cut off rails in order to keep his track from kinking where it would run down grade in a sag, or if this angle bar holds it safely?

Mr. Clark — I will say that we have one grade of about sixty odd feet to the mile, two miles long, and at the foot of the grade we have a bridge one hundred feet from the water. Every year we take up a rail just before we go upon that bridge and cut out six inches to a foot where it goes down hill. Other places, of course, I have had to crowd back, as I presume all of you have, but at this one point we take out from six inches to a foot every year.

Mr. Patch—Mr. President, I would like to ask Mr. Clark how much of that six inches he takes out at one time?

Mr. Clark — Well, I don't want to tell any large stories, for I have the reputation of speaking the truth, generally, you know, but one hot day I took out a rail that was kinked, a thirty-foot rail, and I put in a twenty-nine-foot rail, and there was no space left. Six inches will close up almost any hot day at the foot of this grade.

Mr. Patch—Was there but one rail that was kinked?

Mr. Clark — One rail on a side.

Mr. Patch—And it came together at the foot?

Mr. Clark — It did.

Mr. Patch — When we used to have the old plain fish plate, we had no frogs and switches at that time between Chicopee and Springfield, and our track used to run into Chicopee just about eight inches every year, but we used to cut off about an inch or an inch and a half at a time, so as to keep as tight a joint as we could, and then when it run, perhaps three or four months later, we would have to take another small piece out. But since we have commenced using the angle plate I never have had to cut the rails; they haven't run, and I cannot see that they have stirred at all.

President — I would like to ask Mr. Patch if he put angle plates on at any other place than at the joints.

Mr. Patch—No, sir, not on the Connecticut River Division of the Boston & Maine. I lay all my rails square joints. Our angle plates are punched, so that the spike goes through a punched hole. It is not a slot cut in the angle plate, but there is a hole punched through for both the inside and outside spike. With two ties I don't have any trouble on our division about rails creeping.

Mr. Clark — Mr. President, for the information of the Association I would like to have Mr. Patch state what his grades are of which he is speaking, where his angle plates are used.

President — Mr. Patch, can you give the desired information?

Mr. Patch—Well, thirty-seven feet is the heaviest grade that we have on double track, a small piece at Holyoke thirty-seven feet to the mile.

Mr. Clark—Is that in the yard or on the main line?

Mr. Patch — Well, there is almost half a mile after you get out of the yard. I would say that the lower end of the Connecticut River road is practically level, very nearly so, but we have at Hatfield three-quarters of a mile where there is a thirty-five foot grade.

Mr. French — Mr. President, as long as we are speaking on the creeping of the rail, I would like to ask, simply for information, whether any of the roadmasters have noticed any difference in the creeping of a rail on any certain grade where they have used a rail of two sections. For instance, they might have used sometime ago a rail four inches high, and now they are using a rail five or five inches and a half high, a stiffer rail. What I want to know is, whether there has been the same amount of creeping with the stiffer rail that there was with the lighter one, where the wave motion in the rail was greater.

President — Is there any gentleman in the room who can answer that question?

Mr. Clark — Mr. President, my experience has been that the lighter rail creeps the most on the same grade, that is, where I have taken out fifty-six and put in sixty-six or seventy pound rail. The lighter rail was harder to hold. But that was a plain fish plate, while the heavier rail had the angle plate; that might have had something to do with it.

Mr. Sibley — I have found that on our division a heavier rail does not creep as fast as a lighter rail on the same grade.

Mr. Clark—Mr. President, while this subject of creeping is up I would like to hear from some member who has an expansion joint at the end of bridges. It is used on a great many roads, I don't know whether it is used in New England or not. It is used to overcome this trouble of creeping.

President — I would ask if there is any roadmaster here who has such a thing on his division or road as an expansion joint. It is something new to me. I would ask Mr. Sibley if there is anything of the kind on the New York, New Haven & Hartford road ?

Mr. Sibley—We have nothing known as such. There is room for expansion left at the joint in the holes of the angle bars ; they are left sufficiently large to allow for expansion, but we have nothing else.

President — That is not the question, I think. Perhaps Mr. Clark can give us some information in regard to the construction of this joint, so that we may be better informed.

Mr. Clark — The joint that I speak of is used largely on double track roads, and is a joint that extends along the track like a switch rail ; it comes to a point and laps by, and is flexible, so that when it heats it will crowd together and expand without throwing your track out of guage or out of line. It is used largely in sags and at the approaches to bridges, that is what it was designed for.

Mr. Sibley—I would like to ask if that is what is called a mitre joint ?

Mr. Clark — No.

President — Mr. Drew, we would like to hear from you.

Mr. J. W. Drew — Mr. President, the subject you are discussing has no end to it, I think. There are almost as many different ways of relaying steel as there are men. As regards the matter of raising a track so as to tamp the ties with a bar, if the surface of the old track is good I don't want any tamping done. Adze off the edges where the rail cuts in the tie and lay your steel, and it will be all right if it is not out of surface. If you raise it, say an inch or two, it will take half the summer to get it solid. I never relaid more than 150 or 200 miles, and would like to ask Mr. Collins how he manages to lay a thirty-foot rail without curving on a two-degree curve — that is a thing I cannot do. It will go on a one-degree, but the joints stick out a little. I never could make a thirty-foot rail go on a two-degree curve — if it were an eighteen, or twenty-one, or twenty-five foot, it might go all right without curving it. I would rather it were curved anyway for two degrees.

President — Mr. Collins, can you answer Mr. Drew's question ?

Mr. Collins — I think we should call on Mr. Drew for more information. He has probably laid as many rails as any man in the house, and he has given us but very few points.

President — We are going to have him up again, he only wants his question answered.

Mr. Collins — I don't want to see him sit down so soon. I didn't quite get your question.

Mr. Drew — In regard to laying thirty-foot rail without curving on a two-degree curve. You perhaps suggested that it was where there were broken joints.

Mr. Collins — It seems to me that it makes a great difference whether you lay square joints or broken joints about curving your rail.

Mr. Drew — No doubt of it.

Mr. Collins — I have laid some on one and one-half degree curves without curving the rail at all, and have seen no harm from doing so. I don't think you could tell by looking at it but what it had been curved. It is laid broken joints. When you get above that I should say curve your rail, but when laying square joints I should say curve your rail for one-degree curves.

Mr. Drew — I don't think I ever laid any thirty-foot steel rails without curving on a one-degree curve. To commence at the beginning, in unloading steel, of course a man unloading in the winter would want to skid it off. In the country where I live if the men are careful, they can throw it off into the soft sand, which is about equal to a feather bed. There are no rocks there. My idea is, of course, all rails should be turned up on the ties and straightened — I am a great hand for that—to be sure that there are no kinks in them. As regards having a gang of sixteen men to relay steel, if I were relaying much I should want three or four times sixteen, that is, for laying a mile a day or four miles on a Sunday. I couldn't get that amount laid during the week with sixteen men, I should want a great deal larger gang. I should recommend an extra gang, because it helps the section men very much. I never laid more than four miles or so at a string ; we bolted and screwed up everything ready, not tight of course, because it would bother us about throwing it in. If your surface is fair, new steel rail is safe if your ties are good, and I should not go for bringing it all up and making a new bed, unless your track was in a very bad condition. Speaking of Mr. Clark's roller bender for curving rails, wherever I have been on a road up to this time — although I have not railroaded a great deal — we never got time to pursue this kind of machinery. A man would not live long enough with one of these rollers to curve what steel he wanted. If we were in a hurry we would take a sledge and lay half a mile or so in a day, perhaps. A roller bender is a very slow process, I never had patience with it. I have had broken rails occasionally, and some of my men would imagine that they could see a dent where the hammer had hit the rail, because it happened to break there. It is barely possible that that may have been the cause, but I always supposed it was more imagination than anything else. If a rail won't stand the shock of a twenty-pound hammer, what will it do in the winter when there is a seventy-five ton engine pounding on it ? It might possibly crack it or something of that kind. I can lay more track curving it with a hammer, if I have good steel, because I never have patience to do it with the bender.

Mr. Clark — Mr. President, I wish to say one thing in regard to this curving. If our friend here, has a sharp curve of five or six degrees, I will guarantee to curve more rails in a day with a roller bender than he can with his twenty-pound hammer, if he will do it as well, and on a sharp curve he admits that it is necessary to curve in good shape. I will curve more rails with a roller bender than he can with a hammer — I think I am safe in making that assertion.

Mr. Drew — If I were curving rails for a circle of a turntable I should like one of those machines. Perhaps I have nothing on the main line curved over six degree, not much over four ; I know but two on my road that are over four, that is Wood's Holl and Buzzard Bay.

President — I would like to ask a question, Mr. Drew, before you sit down : Have you had any experience in curving ninety or one hundred-pound rail with a hammer ?

Mr. Drew — No, sir, not over sixty.

President — I would like to hear from Mr. Stevens in regard to laying new rails on the Boston & Maine road, if he is in the room.

Mr. Stevens — I don't think I have anything special to say. I will let Brother Ellis talk about that.

President — I hope Mr. Stevens will give us an account of his work in relaying track. He is a man of large experience in that business. Mr. Ellis is rather out with us, and we want active members to do the talking for awhile.

Mr. Drew — Brother Clark was speaking of these expansion joints, or whatever they were, at bridges and sags. We have lots of them on our road, but they are all at the end of a De-rail, and we don't look to see how much they run. I suppose they run some on a grade, but we don't bother our heads about it. Mr. President, I would like to ask one or any of these roadmasters, if they ever have had any experience at some particular grade where the rail runs on one side down hill all the time, and the other does not stir at all. We have two or three cases on the Cape where the rail runs down very noticeably on one side, and the other never budges from square joints, and I don't know how to account for it.

Mr. Patch — Mr. President, I would like to ask Mr. Drew if your track at that place runs east and west, or north and south ?

Mr. Drew — Nearly north and south in one place that I speak of.

Mr. Patch — And is it the north rail or the south rail that runs the most ?

Mr. Drew — The south rail.

Mr. Patch — I have had just the same experience as that, and it was the south rail that ran. I wanted to see if in other cases it would be the same.

Mr. Collins — When I had a section on the Cape, the track generally, of the section that I had, ran north and south ; the rail on the east side of the whole length of that section, no matter whether it was up or down grade, ran towards the north, and that on the west side would sometimes go one way and sometimes the other. I never could account for it, but the fact was brought very forcibly to my attention, so that there could be no mistake about it, by seeing the position of the spikes and how they had pulled out.

Mr. Sargent — I would like to ask whether that occurred more on a straight line or a curve ?

President — Perhaps Mr. Drew can answer that question.

Mr. Drew — Both, about half and half.

President — We would like to hear from Mr. Dodge of the Montpelier & Wells River Railroad, in regard to relaying steel and also track on grades.

Mr. Dodge — Mr. President, I am probably the youngest member in the room, and have not had the experience that most of the others have. I never laid a great deal of rail myself. In regard to the creeping of rails, my track is all on a grade, most of it heavy grade. I found that before I used the Servis tie plate the rails worked very badly down hill, but since I put those on they do not creep nearly as much. Of course my track is very crooked, with sharp curves of from six to eighteen degrees. I don't know how it would be on a straight line, whether it would creep or not. I have very little straight line in the track, probably not more than two or three miles out of the twenty-four. My main line is also very crooked. I find the Servis tie plate keeps it from creeping and also from spreading, especially on curves. I don't know that it would be so on straight lines, perhaps it might not.

President — Do I understand you to say that your track does not creep as badly as it did previous to using the Servis tie plate?

Mr. Dodge — Yes. I don't think we have cut a rail this summer for creeping.

President — I suppose any tie plate would work the same way?

Mr. Dodge — I don't know why it would not, anything of that kind.

Mr. Patch — If you will allow me to see that report a minute, I will relieve my mind. Gentlemen, I signed that report, but at the same time I do not agree with all that it contains. I signed it for the sake of having a report come in. I will give you my way of handling rails from the time that we receive them until they are in the track. Heretofore we have always contracted for our rails to be delivered by the first of March, and I think for quite a number of years it never has exceeded the 15th of March when they have been delivered at our yard in Springfield. At that time almost every year we have a plenty of snow on the ground. I take a train of from twelve to fourteen cars, and I take men enough so as to make about two gangs for unloading. I put about eight men to a gang — sixteen men. I put a gang at each end of the train when I have got out to where I want to commence to unload, and they go through and unload two rails from each car. That brings the two gangs together in the middle. We move ahead the length of the train, and then they unload again and work from one another. We work like that until we have the whole train unloaded, sliding the rails off into six or eight inches of snow. There is no trouble at all about bending them if you don't let one rail cross another when you unload it. I am very careful, in fact I go out myself to look after all the unloading of rails on our road. After the rails are unloaded they stay there until the time comes for putting them in. Then we go on and we lay the rails up on the end of the ties. If the surface is good they are strung out one after the other just outside the ends of the ties. When we come to a rail that has any defect in it we remove it. For the last three years we have used a roller rail bender for taking out a kink or for curving our rails. Before that for twenty-two years, I always used a sledge hammer. I don't think we ever had a rail break on account of curving with a sledge hammer. I never would allow a man to strike with the small end of the hammer, they would always use the square end, and strike them on the ball of the rail and not on the web. A rail with a small dent in the web will break a great deal quicker, in my opinion, than one with a larger dent in the ball of the rail. The first year that we received rails from Troy, 1872, — that is when we commenced on the four-inch rail — the first winter we had over thirty rails break, and at every place where a rail broke there was a little dent. We called the Troy people to Springfield, to explain to us why those rails broke and the cause of that dent. They replaced all those rails that were broken with new rails, as they considered it the fault of the mill, and we never had any more trouble after that. I will now go on with my work. We curve our rails for everything, from one degree up, and I think I have done so as long as I have been at track work. The part that I do not agree with in this report is where it says that they would bolt up as long a string as time will permit them to lay between trains, before the rails are laid, on the end of the ties, and then when a train has passed, take out the old rails and take the bars and push in the new. Now on our road we have a good many ties that are worn down so badly, and that have been cut down with the adze to keep them smooth, that if we should bolt up those rails on the ends of the ties when they ran the cow catcher over our road it would rub on those rails, and for that reason I never bolt up any rails. I have generally for the last fifteen years got my rail all ready and taken about sixty track men and laid it. I never have any floating gang, never have had since I have been railroading. I take about sixty men on Sunday morning, and I start out and pull the spikes and throw all the old rail out of the track — I will go back a little — I pull the spikes on the inside of one rail and on the outside of the other, and then I throw my rails out and I put in my new rails. Where I leave my spikes in on the inside I push my rail up against that, and where I pull it on the inside I put my rail on the inside. Then I let my men go right along and just spike it right down upon every other tie and not gauge it at all at that time. I find that with our rail in changing from four to four and one-half it widens the gauge doing that about one-quarter of an inch, which I don't think does any harm and is perfectly safe. Then when we go along and put in new ties we gauge our track, and I think we can save a good many dollars doing it in that way, that we would not if we gauged it when putting it in; then you have got to go to work and take out your old ties, and spike them up again with new. After we have got our rails laid every gang goes back on its own section, and the section gang that runs the section where we are putting in rail puts in the ties, and tightens up the joints after they have run about one week. The second time surface, line and dress off. We leave our old rail alongside of the road until we have a call to send it away; if we do have any call for it before winter then we unstrap it and load it on to cars and ship it to wherever it wants to go. If we find we are not going to have any call for that rail we then unstrap it, and pile it up in heaps. That is my experience in the handling of new rail. I would say one thing more. A good many here have expressed their opinion on the amount of shimming,—if I am laying steel rail when the thermometer stands at 90 (and we don't very often lay any except when the thermometer stands at 90), I use no shim at all. I don't see what the object of a shim is between two rails when they have expanded all that they possibly can. Whatever shim you put in there opens the joint every time, and every wheel that passes over that must bend the end of the rail a little. If I am putting in steel when it is cold of course I shim it, but when it is hot I use no shims.

Mr. Paxson — I would like to ask whether a rail will expand any more after it has been worn bright with the wheels than it would before it has been worn at all?

Mr. Patch — I will answer that in this way: my judgment is that old rail will not expand as much as new rail. A rail that has been run over two or three years I don't think will expand so much as a rail that has never been run over at all.

Mr. Drew — I was not aware before that we had a representative here from South America, but it appears we have in brother Patch, whose thermometer stands at 90 while laying steel. I don't very often catch it that way. Down on Cape Cod we commence work in the morning, and we don't catch it but two or three hours a day when it gets up to 75 or 80 perhaps; we don't have it so long enough in the day that we can run the rails right up. I have not seen it 90 this year on Cape Cod. We might lay a few lengths without shimming, but I never would dare trust it without shimming except between eleven and two, perhaps. There is one thing brother Patch does not say anything about. He does everything to a rail almost, but he does not say anything about turning them around and having the running side right. I would like to inquire if he ever knew any difference in the running side of a rail?

Mr. Patch — I would answer that in this way: with our old 58 pound rail there was no running side, both sides were just alike; but our 60 and 70—we are using no 60 now—our 70 pound rail has a running side, and we don't put in new rail unless we put it right side out. He speaks about not laying steel when it was over 80—I have laid steel a number of Sundays when the thermometer stood at 110, and we have had to carry water and cool off the tools that we laid the rails with before we could handle them with our hands.

Mr. Drew — I would like to ask whether it was in the shade or the sun that it was 110.

Mr. Patch — It is very seldom that we lay rails in the shade.

Mr. Drew—You can tell us how the thermometer stood in the shade or the sun, but you had no means of knowing, you guessed at it.

Mr. Patch—I know what they told me when I got home.

Mr. Drew—Well, that is a different matter, probably.

Mr. Clark—One gentleman suggests that it was doubtless a foretaste of what Mr. Patch is going to get at the judgment for laying rails on Sunday, and I shouldn't wonder if it were so.

Mr. Patch—I think you had all better be prepared.

Mr. French takes the chair.

President *pro tem*—We have heard from most of the roads as regards the practice on them in laying rail, but as we have only one representative of the Boston & Albany railroad here, and as he is at present out of the President's chair, I think perhaps we may interrupt him, and ask him to give the Boston & Albany practice—Mr. Lentell.

Mr. Lentell—I supposed when I was elected President that I should be excused from speaking before the convention, but I have no objection to telling you how I lay rail. I unload my rails similar to the way Mr. Patch has explained to you. In regard to the number of men, I intend to have men enough to handle the rail successfully, carefully, and easily. I never string out rails and splice them together before putting them in the track. I say I never have—I will retract a little of that: perhaps I have in a short space, but I don't make a practice of doing that way. Trains are very thick, especially on the First Division of the Boston & Albany. In order to relay track and relay such joints as you think should be relaid, I claim that we should have a single track and have the track all to ourselves until we get the rail in proper condition to run over. Having the track I would put on a gang large enough to go right through and do the different parts of the work under different foremen, and when you got to the end the work would be completed. For instance, I would put on a gang for pulling spikes. There would be another foreman over a gang with bars for turning the rails and pushing the rails out, throwing them out between the tracks all bolted together as rail should be on straight lines. One I would have go ahead on curves and take out the fishes in order to get the rails out. If rails are bolted together I don't see how Mr. Drew is going around his curves on a number of miles, either inside or outside, without closing his rails up tight or pulling them apart, and leaving them unequally divided. After the rails are off I have another gang with adzes, sufficiently large to keep up with the spike pullers and the men throwing the rails out. It would also be under the charge of a foreman, to see that the sleepers were adzed in a proper manner. Then there would be another gang to put the rails on; it takes about twelve men, under the charge of a foreman, to do this, as our rails weigh 95 pounds to the yard or 950 pounds apiece. We then have another gang following along to put on the angle bars. That gang will consist of a good many men, in order to keep up with the men putting on the rails and adzing, and to keep ahead of the spikers who will follow them. That is the way that I lay new steel, and when we get to the end it is practically finished, that is, as far as safety is concerned. At this time we do not change any sleepers. New joint ties would be put in only where ties were decayed or the ties were too small for a joint. In laying new steel it is very rare that you get the new joints on the old joint ties. They will come on different ties, or perhaps a great deal oftener come between the ties. Most of the ties would have to be changed to make them equally divided. That is another thing that I think should be looked after pretty closely, having the ties an equal distance apart. After laying my rails on I spike only every second tie until I get my sleepers out and the ones that I leave in the track moved into position. Then, before I finish spiking it, I put on some kind of a tie plate. The Boston & Albany road believe in tie plates, and we put them on everything as fast as we relay steel. Then the track is spiked up thoroughly. After that a surfacing gang goes through and surfaces up the track. If a track is in good surface previous to relaying I would not raise every sleeper, though I think if the roadbed in one particular place is poor it is a good practice to raise it and let it settle together. My experience with curving rails is, with an ordinary foreman, if they undertake to curve anything less than a two-degree curve they would get the rails curved too much, and I claim that is worse than if they were not curved enough. So I draw the line about on a two-degree curve. I have no serious difficulty in keeping track in good line where the rails on a two-degree curve have not been curved by a machine, with the angle bar, but anything greater than two-degrees I should surely curve. I don't think, Mr. President, I have anything more to say at present. I should like to hear from some of our other members. I think we have seven or eight members who have been admitted to the Association this afternoon. They are all roadmasters, and we want to hear from them.

President *pro tem*—Following out the suggestion of Mr. Lentell, I would call upon Mr. Tuttle, one of our new members.

Mr. Tuttle—Mr. President, I thank you for the honor conferred by calling upon me, but I would rather hear from some of the older members.

Mr. Drew—Mr. President, I wish to answer brother Lentell. He wished me to explain how I shimmed in laying steel around curves. There are two or three roadmasters here who have been with me most of the time when laying 150 miles or more on branches, and I never paid any regard to curves, but commenced at one end and laid right through to the other, from three to four or five miles every Sunday, and bolted up properly. Brother Patch here was speaking about his ties being cut into so badly that he could not lay his rail outside and bolt them up. I always had a man to adze the outside so as to have the rails lie nearly level on the outside, and then when I strike a curve I would shim the outside, of the curve and not shim the inside. When I throw in the inside it generally goes in about fifteen inches and opens about three-sixteenths, and the outside when pushed in closes up. We always use an iron shim—three-sixteenths was what we figured on a thirty-two foot rail. I have always been quite particular in regard to that. If you don't think I have you can ask Mr. Collins.

Mr. Lentell—Mr. President, I would like to ask if in stringing out and fishing together the rails, previous to putting in the track, he tightens up the bolts at the joint.

Mr. Drew—No, leave them all loose. On a very hard curve you would have to double shim and leave two bolts out.

Mr. Patch—I want to ask Mr. Drew one question. I can't get it through my head. He says he shims with iron shims. He says the rail that he is going to push in when he pushes it in will close up. I would like to know how you are going to close two rails up together when you have iron shims in their joints.

Mr. Drew—We don't shim any inside rails, we put them tight; the outside rails we shim so much, on the outside of the curve.

Mr. Patch—What do you shim them for on the outside of the curve?

Mr. Drew—So as to leave it open enough so that it will throw in.

Mr. Patch—When you have got that iron shim on the outside of a curve and are going to shove it in, how can your rails come together?

Mr. Drew—We knock it all out beforehand so as to get it in.

Mr. Patch—Then, what is the use of putting it in?

Mr. Drew—So as to hold it. The jar of the trains would move your steel.

Mr. Patch—Without running on it?

Mr. Drew—Yes. I have had it go two feet.

Mr. Patch—I asked for information, that is all.

Mr. Drew—That is all right. If you ask too much, I shall have to get brother Collins to back me up. Mr. President, a little more in regard to laying steel, I think I have not said quite enough. Brother Lentell was telling about having a sufficient number of men to bolt up, adze, and all this, that and the other—when I have been laying steel on a Sunday, four or five miles—five miles was the most I ever laid, I have laid four miles in six hours on a Sunday—I divided the men up, so many men to throw old iron out, so many men to throw new steel in, so many men to adze, so many men to draw spikes, so many men to gauge up and spike, and so forth ; I calculated to divide up 100 or 120 men so that one gang would just about keep driving another. Sometimes the men who were drawing spikes ahead—I had brother Collins there once in a while—would get out of my reach a little, and I would put on a few men and catch up with them. In that way generally I kept almost everybody at work until the thing had been fully completed.

President *pro tem*—It seems to me that this is getting interesting enough to make it unnecessary to call upon any of the members. We would like to have a little voluntary speaking, if possible. If not, we have with us Mr. Jackman, who is laying steel, and laying a lot of it, and we would like to have him give us the practice upon his division.

Mr. Jackman—Mr. President, I did not expect to be called upon to say anything, I am only a second man, you might say. I am laying steel in a manner similar to that in which the rest of these gentlemen are doing it. My custom is to bolt rail up, although I should favor laying in a rail at a time where we can get time. On our single track line we have to bolt it up and put it in when we can. I don't think that I should care to bolt a very long string on a curve, or undertake to put it in, because I think it would either shove or tear apart, so that we would get either too much space or not enough. We generally skid off in unloading, and we use an old fashioned bending or curving machine to curve rails. I had an Emerson bender, but we thought that was almost too slow, so we used our old beam springer on curves. I don't know, Mr. President, as I can say anything more, I would rather listen than be listened to.

Mr. Drew—I am fearful that we are going to run short of time, because we are not getting along very fast with those reports, and it is now almost five o'clock. I don't know what to suggest to hurry up the business, but I am afraid if we are going to have a part of the day for our excursion to-morrow we won't get our business done, and we profess to be hardworking fellows here in this Convention. Perhaps some one will suggest something that will forward business.

The President retakes the chair.

Mr. French—I would like to ask, for information, one question. A great many of the roadmasters here lay their rail all bolted together before throwing into place. That rail I take to be 60 pound rail or perhaps 67. Now I want to ask if those roadmasters would adopt the same practice in laying the heaviest rail that other roads are laying to-day, that is, 95 pound rail; wouldn't they then change their practice and not lay in strings, but lay one rail at a time?

Mr. Drew—Mr. President, I never laid anything above 60 pound rail, but if I were going to lay one that weighed 160 pounds I should not vary my practice, because it don't make any difference about the size of the rail. A darning needle will expand just as much endways as a rail of the same length. If it was properly held I don't see how it would make any difference whether it was a heavy rail or a light rail. A large rail won't expand any more than a small one.

Mr. French—It was not the expansion point that I wanted to bring out, but it was the labor of laying that heavier rail.

Mr. Drew—I don't see that it would make any difference.

Mr. French—I would like to hear from others in regard to that.

Mr. Drew—Here is brother Collins who has laid the heavier steel.

Mr. Collins — I should certainly want more men on 70 pound rail than on 60 pound.

Mr. Drew—Certainly, but he means the manner.

Mr. Collins—Oh, yes, in the same general manner.

Mr. Patch—They always told me, Mr. President, at the rolling mill, where I have always been out to inspect all rails that we have received since I have been a roadmaster, that the heavier the rail the more it would expand. Brother Drew says that a darning needle will expand just as much in length as a 90 pound rail. I would like to hear from some others, and see if they have ever discovered any difference. They told me that when they cut off a 56 pound rail and a 70 pound rail they allowed over half an inch difference in cutting; they cut the 70 pound rail over half an inch shorter than they did the 56 pound rail, when they were sawed off.

Mr. Drew—Mr. President, I got my information from scientific men. Brother French, being a civil engineer, probably will know. Brother Collins probably knows something about it. I got it from Mr. Morrill, Chief Engineer of the Old Colony System. He said it didn't make any difference about the size of the rail, the expansion was the same end-ways.

President—We would like to hear from Mr. Bodwell, of the Boston & Maine, on this question, the best method of relaying track. We have not heard from him yet.

Mr. Bodwell—Mr. President, my experience has been that in relaying steel and iron that the heavier the rail the more it will expand, and a 72 pound rail will expand considerably more than a four inch rail that weighs 60 pounds. That has been my experience. I think if you take a rail with a heavy ball, the same as our 72 pound rail, it will expand more than the same pattern of the four inch rail.

Mr. Patch — Mr. President, in rolling rails, after they have come from the roller—I am offering this to back up my statement that a heavy rail will expand more than a light rail—when rails come from the roller after they have been sawed off they are put into a machine and there is about three feet of camber put into those rails when they are red hot. That camber is put in so that when the rails cool off they will be straight. If the rails should be run from the roller right out on the platform, without any camber being put into them, after they had contracted and got back into their shape there would be two feet bend in every rail; because the web or light part of the rail does not expand as much as the ball of the rail.

Mr. Drew—Mr. President, I got my information from men whom I supposed knew. I never investigated it or read books on the subject. Perhaps brother French can help us out of it; he is a civil engineer, and ought to know. Almost any scientific man ought to know. I have always been informed that it made no difference, that a knitting needle would expand just as much in length as a rail would. I wouldn't swear to it, of course, but I have always had that impression, and have always been told so.

Mr. Patch—I would like to ask one question. Perhaps it would not come into this, but would be a different case. If you are sawing out green lumber, and you saw out boards one inch thick and fifteen inches wide, and then you saw out boards that are six inches wide, when those boards dry won't you have a good deal bigger crack between the boards that are fifteen inches wide than the boards that are six inches wide?

Mr. Drew—I should say so, but that is not iron or steel, that is wood. Perhaps brother Clark might give us a little light on that.

President—Brother Clark is called for.

Mr. Clark—If brother Drew will tell me what the question is.

Mr. Drew—Some of the members say that size makes a difference about expansion. I have been told and understood—I may have been wrongly informed, but I have always had that impression—that it made no difference whether it was a darning needle or a steel rail, as regards the amount of expansion.

Mr. Clark—I think the temperature controls that.

Mr. Drew—Yes, but a darning needle of the same temperature would expand the same as a rail would of the same length. Still I might have been misinformed, I couldn't say.

Mr. Clark — Mr. Patch's illustration here applies to an eighteen or a thirty foot rail. Of course the thirty foot rail would expand more than the eighteen, just as much as a fifteen inch board would shrink more than a six inch.

President—I would like to hear from Mr. Sargent, of the New York, New Haven & Hartford road. He has had a large experience in track work.

Mr. Sargent—I don't believe I can improve any upon the arguments that have been made here. My experience in laying rail has been very limited of late, so far as heavy steel and light are concerned. I cannot give you any information. I have had very little practice with heavy rail in regard to expansion. The handling of rails has been very fully discussed, and I don't think that I had better occupy any time, or try to give you any information in regard to that.

President—Mr. Glynn.

Mr. Glynn—Mr. President, young members come for information, not to advance new ideas. I have had a little experience with heavy rail. In my experience I have noticed that a heavy rail does not expand as much as a light one, for the very reason that it is so much heavier and larger that it does not get so hot. I think that the amount of steel which keeps cool inside holds the outside from expansion.

President—I would like to hear from any other members who have had any experience with heat and cold in regard to the movement of the track or rail.

Mr. Clark—The theory of expansion of a large body and a small one was illustrated, I think, in the erection of the first bridge across the Mississippi at St. Louis. That was built by the engineer who had charge of the jetties, I believe, at the mouth of the Mississippi. Those steel arches were figured to go together, as I remember it, at a temperature of sixty degrees, and they took their figures from smaller pieces of iron which they experimented with, and had this arch constructed so that the keystone, you might say, would exactly go in place at sixty degrees temperature.

By some mistake or other, some hitch in the proceedings in erecting that bridge, the temperature was up to eighty when they got ready to put that arch or keystone in. They waited several days, and the temperature was not right, did not get down low enough, and they finally, in order to get that keystone in, made an ice poultice of some thirty tons of ice, and contracted the arch sufficiently to get it in. That would prove the theory of contraction and expansion, I think. When they reduced the temperature of that iron to the proper point or sixty degrees it dropped in immediately.

Mr. Patch—I don't think that comes right to the point. The point is whether a large body will expand more than a small one. It is not in the temperature, of course the temperature would be the same in both cases; but with the temperature at, say one hundred and ten, will a large body expand more than a small one? This evening if we get a chance to ask the question we shall have a man with us who can answer it.

President—There seems to be a little difference of opinion on this subject, and I am glad that there is, for I would like to get at the truth. I would like to hear from Mr. Stickney in regard to manner of laying rails, preparing them for laying, and taking care of them after they are laid.

Mr. Stickney—In most of the talk that we have had here this afternoon the majority of the speakers have seemed to go on the principle that they did all their work on Sunday, everything was done on Sunday. Well, now, I am on a road where they have a great deal of respect for the Sabbath day. They don't allow us to do our work on Sunday any more than we can possibly help, and laying steel rail is not one of those things we do Sundays. All steel rail that I have laid has been done during the week, between trains. I laid something like fourteen hundred tons last year and probably eight hundred tons this year. Last year I laid between trains sixty tons a day. I find that the only way I can get them in is to bolt up my rails on the end of the ties, and where I have ties like those spoken of by brother Patch I adze them down so that they won't interfere with the cowcatcher; then I take a sufficient stretch between trains and throw them in. I lay them entirely with a separate gang which is devoted exclusively to that work. Behind that special crew I have another that attends to the general surfacing and to renewing what ties are necessary. We find a great many disadvantages in working in this way. I am free to say that sometimes I would rather work Sundays than to have to work the way I was obliged to this last year. I have known some work to lie for three years all ready to go in because I could not get time enough between trains to put it in. But where I am laying this year I don't have so much trouble, because the trains run a great deal less frequently. My practice in curving is to curve everything from two degrees up. Any rail that is not straight goes through a rail bender. I use an Emerson. It goes through the bender and is made straight to fit the tangent. I never succeeded in keeping rails in good line that were placed on curves without bending. When I was on the Central Massachusetts there was about forty-eight miles that was laid straight without curving, one curve up to eight degrees, square joints, and I always had a series of elbows. I went over the greater part of that before I left it and curved the old steel that was in the track, and it made it more satisfactory. I certainly should curve all my steel on curves and straighten it for straight lines. I think that is the general practice on the Boston & Maine.

Mr. Patch — I would like to ask the last gentleman up— he says that he lays his steel with a steel gang (I suppose he means by that a floating gang, for the reason that he puts it in week days)—I would like to ask him, if he had no floating gang, but only about six or seven trackmen in a gang, would he put in his steel between trains or take Sundays?

Mr. Stickney—That would depend a good deal on the superintendent or the general manager. If he would not let me work Sunday I would take a section perhaps and put it in week days, but if he would let me work Sunday I think I should prefer to put it in Sunday.

Mr. Patch—Mr. President, I don't think any of us would have any trouble in getting permission to put steel in on Sunday if we could show to them that we could save from seventy-five to a hundred dollars by the operation.

Mr. Stickney—I will say that two years ago, prior to the time that Mr. James P. Furber died, there was no man on the Boston & Maine road who could show him any reason why we should work Sunday in laying steel rail. Perhaps Mr. Patch might be able to show him, but at that time the man did not exist on the Boston & Maine road. How it is now I don't know perhaps we might get permission to work Sunday.

Mr. French—Mr. Patch seems to be firmly of the belief that a heavier rail will expand more than a light rail. I would like to ask him if he would use a different shim in laying 95 pound rail, on account of the expansion from what he would use in laying 50 pound rail.

Mr. Patch—I would answer that in this way: As a general thing it is so hot when I lay steel that I don't shim it. But if it was cold, with the experience that I have had, I should shim the heavy rail more than I would the light. I may be wrong, I don't say but what I am, but that is what I want to find out; I want somebody that can tell us, if they know. But I have watched our 70 pound rail, and it does seem to me that I can see that it expands and contracts more than the 50 pound rail.

Mr. Bodwell—Mr. President, I would like to ask some of these gentlemen if it makes any difference in laying heavy steel in the track where there is a series of curves or on a straight line, whether you will notice any more expansion in a straight line than you will on a curve?

Mr. Patch— Mr. President, I would answer that, for my part, in this way: Perhaps on curves it might throw out a very little all the way round, and you would not notice but what you had just the same line or just as good a line as you had before; but if it is on a straight line it must warp so that you will notice it.

President—I would like to hear from some of the members further back in the room. They have listened to the discussion, and must be getting interested, and they should give us their ideas on this question. I would like to call on some of our new members, if they are in the room. Charles H. Jones, of the New York, New Haven & Hartford road—I would like to hear from him.

Mr. Jones—Mr. President, I don't know that I have anything to say on that subject. I would rather listen to the older members.

President—Myron E. Drew, of the Old Colony.

Mr. Myron E. Drew—Mr. President, I would say as Mr. Jones does, that there many older members to whom I would rather listen. I have always been brought up to practice the methods generally recommended here.

President—Perhaps some of you gentlemen have forgotten some of these questions, and I think it would be well for our Secretary to read them over, so that our memories may be refreshed. We are confining ourselves perhaps to one point, and not considering the whole question.

Mr. French — The first question is, Should new ties be laid under all new joints or old ties allowed to remain under same ? 2. Should old spike holes in good ties be plugged or remain open ? 3. Should all track relaid be raised enough to allow all ties to be tamped with tamping bars ? 4. What is the maximum degree of a curve rails should be laid on without being curved before being laid in track ? 5. Is it necessary when the track is raised one inch to tamp every tie inside and outside with tamping bars ? 6. Is it economy to turn old ties bottom side up that have not been in track more than two years ? 7. What number of men would be considered most economical to have in said gangs ? 8. Would you recommend special gangs or add extra men to regular gangs for relaying rails ? 9. How would you govern the subject of expansion and how much is to be used ? 10. What position should outside and inside spikes occupy in same ties ? Mr. President, I move that the chair appoint a committee of three to act on this report which has been submitted by the committee, to see whether this report is the sense of the Convention, to answer these ten questions in a way that will also represent the sense of the Convention, and then that the committee bring in their report and the Convention vote on it. We have got to wind up this question to-night in order to have time for the three other questions to-morrow.

The motion was duly seconded and carried, and the President appointed on such committee Samuel Greer, of the N. Y., N. H. & H. R. R., A. C. Stickney, of the B. & M. R. R. and R. P. Collins, of the O. C. R. R.

President—Now this will not shut off the discussion on this question. I hope this committee will get ready with their resolutions so that we can wind this question up before going to supper. Now I would like to hear from H. J. Glynn, of the Old Colony road.

Mr. Glynn—Mr. President, I believe I just made a few remarks, and I was a little fearful at the time that some of these older members would ask me questions, so I hardly dare to say anything more. They are pretty sharp, and I think that I would rather be excused, for the reason that I am not posted enough to answer these pointed questions. I came here to learn rather than to teach others.

Mr. Drew—I would suggest that this committee be instructed by the President to cut that report somewhat short. A good many things in that report are altogether superfluous and don't amount to much ; they might possibly cut it short.

President—It seems to me, Mr. Drew, that on those ten questions there should be a resolution presented to be adopted as the sense of this Convention.

Mr. Drew—Those can all be answered, but they need not add a great deal to them ; perhaps they might cut them short.

President—I don't think this committee will present any very extended set of resolutions, I hope not anyway. I would like to hear from Mr. W. E. Tuttle of the New York, New Haven & Hartford road.

Mr. Tuttle—Mr. President, I believe I was called on once before and asked to be excused.

President—We would like to hear from Mr. George K. Thornton, of the Boston & Maine road.

Mr. Thornton—I am in the same box with Mr. Tuttle. I would like to be excused, I have nothing to say.

President—We have another new member that I recognize here, a man that has laid a great deal of steel and handled a pretty good gang to do it, and that is Mr. Frank Hyde, of the Boston & Albany—I would like to hear from him.

Mr. Hyde—I agree with most of the views that have been expressed, and ask to be excused.

President—Mr. Braley, of the New York, New Haven & Hartford—I believe we have not heard from him.

Mr. Braley—I could not add anything to what has been said, Mr. President.

President—I would like to have him give us his experience, perhaps he could give us some points.

Mr. Braley—I am about like the rest of the old ones in my experience, and would have the same story to tell.

Mr. Sibley—I understand we have a few minutes now that are not required for the discussion, that is, the subject is under advisement, rather. There are one or two names presented for membership not yet acted upon. Could we not vote them in now if we are to receive them? They may want to take part in this discussion.

President—There is one name before me here that I suppose could properly be voted on at this time. I have here the application of M. C. Hamilton, of the New York, New Haven & Hartford road, in charge of the Hartford Division—what is your pleasure in regard to this application?

Mr. Sibley moved that Mr. Hamilton be admitted to membership. The motion was duly seconded and carried, and Mr. Hamilton declared elected a member of the Association.

President—I would like to ask the committee on entertainment if they are ready to report now while our committee on resolutions is out. Is Mr. Bodwell in the room ?

Mr. Bodwell—Mr. President, your committee have decided not to take a small boat. They have made arrangements to go to Bass's Point on a pleasure boat to leave here at 2.30, to have a fish supper and a drive on the east point. After supper a musical entertainment, a band concert, in the evening. Tickets have been secured at reduced rates. The regular tickets are fifty cents and we get them for thirty cents for the members. They can accommodate fifty to a hundred if necessary.

President—A band concert on the boat ?

Mr. Bodwell—No, there is to be a band concert on the point.

President—Gentlemen, you hear the report of your committee—is any action necessary on this ? Does the committee want any instructions or information ?

Mr. French—Mr. President, I understand that the committee has already made the rates—a reduced rate—and have got the matter of obtaining the tickets in hand. Is that so ?

Mr. Bodwell—Yes.

Mr. French—So that all we want to do is to have it thoroughly understood what the excursion is and talk it up with all the members, and have them understand what time the boat leaves.

Mr. Bodwell—As the time is short we were obliged to go ahead with this business ; therefore it lies with the meeting to sanction our action, as I understand it now. We would like to know about how many want to go, by half past eight to-morrow morning, if we could.

Mr. French—I move that the chair appoint a committee of one to ascertain between now and half past eight to-morrow morning how many, including the supply men, we can count upon going on that excursion, so that we will know how many tickets to obtain.

The motion was seconded by Mr. Sargent and carried, and the President appointed Mr. Bodwell as the committee.

Mr. French—Mr. President, to resume our discussion of the question of laying rail—there seems to be a difference of opinion on the subject. Some say that they would lay 95 pound or any section of rail in stretches, just as they would the lighter rail; others say that they prefer to lay rail one at a time, and put fish plates on after the rail is laid in place. Now I would like to hear the arguments *pro et con* on these two methods of laying rail. Will you call upon some members to give both sides of the question.

Mr. Drew—Mr. President, I have laid more or less steel rails for ten or a dozen years, but never laid anything over sixty pounds to the yard. It seems to me that if I were going to lay rail that weighed 160 pounds I should not make any change in my manner of laying. If there is any roadmaster here who has laid 60 pound rail and then also 85 or 90 pound rail, we might get the information; but I couldn't give it, because I never laid anything over 60.

Mr. Hamilton—Mr. President, as I am a young member I hope you won't think me presuming, but I had this thing come up on the Hartford Division. We are taking up 60 pound rail, which is 3¾ inches high, and we are laying 6 inch rail, consequently it is necessary that the rail be laid in separately on account of the difference in height, the new rail being to high to clear our pilots. That is a positive objection that we have to meet there.

President—I would like to ask Mr. Hamilton which he would prefer, providing he had an equal chance in laying his track—it seems to me that that is the way to get at the best method of doing it—provided you had an even chance to lay your track? Would you fish them together before or after they are laid in position?

Mr. Hamilton—Mr. President, I never had an opportunity to compare the two ways, and don't think I can tell. I can say this, that I have noticed on the Pennsylvania road, where the rails they are now laying are 95 pound, I should judge, they are laid in on a string. But their rail is of a particular character, 5½ inches high. They are taking out 74-pound rail and replacing it with this 5½ inch rail. I cannot answer your question, because I have not had the experience.

Mr. Sibley—I would like to say that we, in putting in new rails, have made something of a compromise between the two ways. We strap together five or six rails, bolt them tight together, and then leave one with the fish plates or angle bars off, and then bolt together five or six more, and in that way we can easily put them in, and crowd them backward or forward, if necessary. We can put in three or four miles in that way, without any trouble. But for the last few years we have not found it necessary to get so much connected, to put in so much at a time. We put in a few rails at once, just as we can find time between trains.

Mr. French—There seems to be quite a difference of opinion. For instance, the Boston & Albany road in laying their new rail, as I understand it, or at least on the first division, use only one method, and that is to lay each rail in separately. Then you go to another road, and they do not use that method at all—they put in a stretch. Now it seems to me that there must be some good argument in favor of one or the other. I would like to have some gentleman called upon, who, if he can, will furnish some figures or facts showing which is the most proper way. There is a difference in the way of doing it, and one way must be better than the other. I would like to have you call on Mr. Patch, and ask him why he would lay his rails one at a time, to get some reasoning in it.

President—Mr. Patch, we would like to hear from you with regard to the best method of laying rail, whether to fish it together, previous to putting in the track, or after the rail is in position.

Mr. Patch—Mr. President, the Connecticut River railroad for years was a very small road, while the Boston & Albany has always been a very large road. I should prefer to have Mr. Lentell, our President, give his reasons. I think he can do better than I can on that subject.

Mr. French—Mr. President, if it is not pushing you into a hole, I will offer to take your chair just while you tell us your reason for choosing to lay one rail at a time.

Mr. French takes the chair.

Mr. Lentell—Mr. President, I don't see as I gained anything by calling on Mr. Patch. I thought I was going to get my question answered, but he has disappointed me, and is going to try to make me answer it. I don't know as I can give any reasons that would satisfy you. I have some reasons in my mind. I see very well why it is that some roadmasters bolt their rails together for a mile or two miles in length and throw them in. They can do that with trains running on the track while that work is being done. by so doing they gain time ; they can have more time between trains. But I don't believe—I will say I don't think, that a man can properly get in a mile or two miles of steel bolted together, especially if it is partially on curves, and have the distance rightly divided for expansion in the different joints. I have had some little experience in that work, where we have had no time to put in rails separately and perhaps we would have two or three or three or four rails together. In doing that on a sharp curve—a very sharp curve—you have got to crowd your rail very hard to get it in place, and it will bring your rails solid together or else pull them apart, and it does not make a proper joint. By using very careful judgment, and shimming, or, as Mr. Drew says, double shimming, or leaving some of the bolts out, you might get your track to stay there, but you will have it perhaps all in one joint, or may be two joints. I think that if a rail is laid in the place where it belongs, and fished and bolted afterwards, and brought right up tight before it has moved, there is no danger of kinking the rails. In crowding in a stretch around a curve, after it had been pushed in, the rails would point out in one place and in at another, and it don't seem to me that it is the proper way to do. I don't know, Mr. President, that I have any further remarks to make now. It is only by experience that I think this is the proper way. It is only my opinion, and not offered as criticising anybody here, but just my individual opinion. I don't know that there is another man on the road who thinks as I do about it. But I know that rails on the Boston & Albany road are laid in one at a time. Where we have plenty of time, of course it is an advantage. If we did not have any time, if we could not have the track, if we had a single track railroad, I see again where we should have to fish it together. But our superintendents and managers are very good indeed about giving us the track, and where we want to relay they are very willing to make a single track for us, or do anything to help the roadmaster. That is a happy feature of the Boston & Albany management that it is very thoughtful of the road department, and will do everything it reasonably can to help the roadmaster along with his work.

Mr. Lentell retakes the chair.

Mr. Drew—I shall have to disagree with you, Mr. President. I have laid 120, 140, 160 or 170 miles, laying three to six miles at a stretch, and running around curves and everything else, and I can pick out four men in this house who have been with me, and I never had any difficulty with the expansion or contraction, it was all right. We would lay four or five miles of a Sunday without any trouble at all. Where can you pick any flaw? What is there that is not right about it? It comes right in the track. If we were going to put in one rail at a time, a man would not live long enough to relay a couple of hundred miles between trains; and the steel being a different make from the iron, you would have to get every length laid in every time a train passed. There are others who can prove the statements that I have made, and I guess they will back me up. They have been on the road, and have had success on it. The shimming was all right, and I never saw a rail on the road sprung by the heat.

Mr. Clark—Mr. President, I will give you my reasons for laying a single rail at a time. I think you can do it cheaper. I think you can put that single rail in, spike it in place, one or two spikes or may be three to a rail, enough to hold it in position, and put your fish plate on and screw it up, cheaper than you can put it together on the outside. I think the way trains are run ordinarily, that you can get in just as much in that way in a week as you can to string it together on the outside. You certainly can bolt it up cheaper and keep your expansion better. That is my reason for putting it in that way. You can lay a mile of track cheaper by that method that Mr. Patch and you and I use than you can to bolt it together on the outside.

Mr. French—Then, isn't it simmering down to this—I am quite anxious to have an expression regarding this matter, because it is one of the principal points in laying new rail—doesn't it come down to this, or isn't it approaching this: That if you have time enough, or can make arrangements with your train despatcher, it is better to lay one rail at a time? Isn't it becoming the sense of this Convention that this is preferable, if you can make arrangements to have the track. You don't bolt up but once, any way, as Mr. Clark says, and you pass on and have your joints all right for expansion. When you lay them in one at a time, you make a sure thing of it, a perfect thing of it. You can certainly work just as rapidly, as Mr. Clark says, and quicker, I think, laying them in one at a time, if you can have the track. If you cannot, you have got to do all that work beforehand and then just take the time that is necessary to throw the rail in. Isn't that the reasoning on the two methods?

President—I would like to ask Mr. Drew two questions: How far outside the rail would you lay your new rail when you are bolting it together or getting ready before throwing it in place?

Mr. Drew—Fifteen inches.

President—In going around a four or five-degree curve how much opening would you allow?

Mr. Drew—Double shim every joint for a four-degree, and then throw it in. It is not always quite fifteen inches out, it might not be more than twelve.

Mr. Jackman—Would you screw your bolts all up tight?

Mr. Drew—No.

Mr. Clark—There is another point about laying rail in the way Mr. Drew speaks of and in the opposite way. It costs twice as much to throw that old rail out if you have got to throw it over your new rail, as it would to throw it out if your new rail was not bolted on the outside of the tie; there is more work there.

Mr. French—That is another matter. It strikes me that it is the better way to lay one rail at a time. It strikes me it is a question of whether you can have the track or not. If you cannot have it, except for only a short time, you have got to lay it in stretches, but if you can have it, lay rail as they do on the front, right in place and one at a time. They never go to work and lay a long string ahead and bolt it together for the sake of bolting it together at one time. They lay one rail at a time and fish it and make it fast. Isn't our investigation of this matter resulting in the belief that it is better to lay one rail at a time if you have time to do it?

Mr. Drew—Mr. President, I wish to reply to brother Clark, who has been telling of the expense of throwing out old rail. I have laid four miles of a Sunday in six hours, and it took two men one day, at a dollar and a half a day, to throw out the old rail for four miles. You can see it is not very expensive to throw the old rail out. In my opinion, if we had ever come down to this one rail business we would have had no road to the western coast, the Union Pacific would not have been built. It is a slow process, it is back about fifty years, I should think. That is my experience.

Mr. French—Mr. President, I have not worked on the Union Pacific, but on the C., B. & Q. we laid one rail at a time, and I want to ask Mr. Drew if he were laying one hundred miles of track on a new road whether he would go ahead and bolt all of his rail together before he threw it in to line? Wouldn't he, under those circumstances, lay one rail at a time and fish it up in its place?

Mr. Drew—Mr. President, I should be obliged to do that, because the material comes up in the rear, you know, and it would be no advantage. You have no old track to run it along on and lay it out and bolt it. If you had it would be well enough to do that same way, in my opinion.

Mr. French—Mr. President, I would like to ask Mr. Drew a question. He said that there would have been no Union Pacific R. R. built if they had laid one rail at a time. By laying one rail at a time in position and bolting it up afterward is just the way the track was laid, as of course there was no old track to string out rail beside of.

Mr. Drew—They had a machine that would take rails thirty feet long and toss them into line, like this (raising both hands above his head and throwing them forward). That is the way they built that. Of course I would do it that way if I had that kind of a machine.

Mr. Patch—Mr. President, I would like to ask Mr. Drew if he thinks it would have been better if they had had that machine made a seven-foot gauge, and had the rails laid out on the end of the ties and bolted together and thrown in, than to have laid them right in place as they did?

Mr. Drew—No, I don't think it would.

Mr. Hamilton—Isn't this entirely a question of what the force is that the roadmaster has at his command? If he has a large enough force isn't it cheaper to lay the rails in one at a time; and if he has a small force, a floating gang of twenty or thirty men, isn't it better to bolt them up on the outside?

Mr. Braley—Mr. President, I never bolted many rails together, I never had any luck in doing it. I usually laid them on Sunday, one at a time, and I have laid three miles and a half, with thirty men, and laid them all in and bolted them with two bolts, so as to make it safe, and spiked them.

At the request of the President Mr. French takes the chair.

Mr. Lentell—Mr. President, it seems to me that by putting in one rail at a time you save one motion or one handling. Mr. Drew has got to pick his rail up, and it is not any more work to put it in place than it is to put it on the end of the ties—it is scarcely any more. It seems to me that you save one movement. Now in regard to laying a large piece of track, we have a man in this room, who laid two miles of track, and got it all ready to run over before two o'clock, last Sunday, and laid it one rail at a time. I cannot see him at this moment, but he is here. As fast as they bolted it up it was ready to spike. The bolts were all screwed up tight, and it saved all this crowding and pressing and all the good judgment which it must require to be very particular with your shimming going around curves, and the trouble of taking your shims out and afterward going over your bolts again and tightening them up. And it is certainly more trouble to throw old rail out if you have got your new rail on the end of your ties. You have not only got to crowd your old rail out over the end of the ties, but you have also got to raise it four or five inches, whatever the height of your rail is, and throw it over. Then you have got your shims in loose, because you cannot tighten up until you get your rail in, and the old rail is knocking your shims out. You cannot help it. It has got to slide on top of the new rail. It seems to me that putting in one rail at a time is the best way, and I think the cheapest; but I should say on single track roads where you have got to get your trains through, and there is no other way but to use this track, that perhaps it is absolutely necessary to put it in in a string in order to accomplish any work. Where you have double track and your officials are willing to help you out, it seems to me that one rail at a time is the proper way to put it in.

The President retakes the chair.

Mr. Drew—Mr. President, I don't see any particular objection, of course, in laying track one rail at a time, if you have an opportunity and double track, but when you come to a road that is single track, and trains are just thick enough so that you cannot put in but two or three rails at a time, it is quite expensive, and you don't get along any. As far as the shims or anything of that kind troubling me, that is the least obstacle in the world. I never knew one to be knocked out. The old iron is bolted together in a long string, and is a good deal like a boa constrictor. You have it strung a hundred feet almost parallel with the other rail, and it cannot knock the shimming out or anything of that kind. If there is plenty of time, there is no objection to laying in rail singly, and you know that each rail is perfect. The most that I ever laid in a day was five miles, and then of course some things were slighted, but nothing very vital; rails were laid, smooth enough, adzed off enough, and spiked enough; it didn't injure the steel any, but in rushing with spiking four or five miles a day, in very hot weather; with the thermometer perhaps up to where brother Patch says, 110, why, they might not always get perfect gauges, but got it near enough for all practical purposes.

Mr. Patch—Mr. Drew speaks about single track trains running—I would like to ask how he puts in four miles and a half of track in a day on a single track with those trains running?

Mr. Drew—I didn't understand you.

Mr. Patch—You were saying that it was necessary to put it in because it was on a single track and so many trains running, and I asked how you can put in four miles and a half unless you have got plenty of time?

Mr. Drew—Had to do it Sunday.

Mr. Patch—Then why not lay it one rail at a time on Sunday?

Mr. Drew—Because we couldn't get men enough together, haven't got section men enough.

Mr. Patch—How many do you want?

Mr. Drew—An army.

Mr. Patch—You wouldn't want any more men, and I will guarantee you would do more and better work the other way.

Mr. Hamilton—Mr. President, I have just been through quite a little re-laying of rail. From three weeks ago last

Sunday to the present time I have laid twenty miles of 100 pound rail. My plan has been to lay Sundays and week days on the Hartford division. The longest period when we can work does not exceed forty minutes. The result of that work has been about three-quarters of a mile for week days and two miles for Sundays. The gang is eighty men. It is entirely a floating gang, except the one section which we are going over have orders to furnish supplies.

Mr. French—Mr. President, I move that we adopt this resolution as the sense of this Convention, that when other things are equal, the proper way to lay rail is to lay one rail in at a time and fish it up in place. Does Mr. Drew second that motion ?

Mr. Patch—I second that motion.

President—It is moved and seconded that all things being equal, the proper way to lay main track is to put one rail in at a time, and properly fish it up in its place, rather than to stretch it along the end of the ties and crowd it in in a string. Is that the motion ?

Mr. French—Yes.

The motion was carried without any dissenting votes.

Mr. Greer—The committee appointed to act upon the report of the committee on the question, Best method of laying rail, etc., and to ascertain whether it is the sense of this Convention respectfully report as follows : They adopt the report submitted by the committee, and make the following answers to its ten questions :

1. Should new ties be used under all new joints, or old ties allowed to remain under same ? Answer : If old ties are of suitable size, and sound, they should be allowed to remain.
2. Should old spike holes in good ties be plugged, or remain open ? Answer : All spike holes in good ties should be plugged.
3. Should all track re-laid be raised enough to allow all ties to be tamped with the tamping bars ? Answer : We recommend that in ordinary cases track be raised enough to give all ties an even bearing.
4. What is the maximum degree of a curve rails should be laid on without being curved before being laid in track?

Answer: One degree for square joints, two degrees for broken joints.

5. Is it necessary when the track is raised one inch to tamp every tie inside and outside with tamping bars? Answer: Bar tamp every tie on the outside and inside when grade is coarse and heavy; if ballast is sandy, shovel tamp inside.

6. Is it economy to turn old ties bottom side up that have not been in the track more than two years? Answer: It is not economy to turn old ties.

7. What number of men would be considered most economical to have in said gangs? 8. Would you recommend special gangs, or add extra men to regular gangs for re-laying rails? Answer: We recommend crews of fifteen men and foreman.

9. How would you govern the subject of expansion and how much is to be used? Answer: We would recommend iron shims while rails are being bolted, to secure proper spacing, ranging from two-sixteenths to four-sixteenths of an inch, to be removed as soon as bolted.

10. What position should outside and inside spikes occupy in same ties? Answer: We recommend that spikes be driven on the same edge of the tie inside the rail, and on the opposite side outside the rail.

SAMUEL GREER,
R. P. COLLINS, *Committee.*
A. C. STICKNEY,

President--Gentlemen, you hear the report of your committee on resolutions on the first question, in regard to the best method of laying rail, etc., what is it your pleasure to do with it?

On motion of Mr. Paxson, seconded by Mr. Patch, the report was accepted and adopted.

President—Mr. Secretary, is there any other business to come up at this session?

Mr. French—I would simply remind the members of the address this evening, and then after we do adjourn, I would like to have them pay this year's assessments. I think this would be as good a time as any, right after we adjourn.

President—I hope all the members will attend to-night. We would like to have every member go to-morrow afternoon so that we may have a large representation. The more present the merrier will be the time.

Mr. French—I would just emphasize the point about every member being here this evening. Mr. Dudley is crowded with engagements, and at considerable sacrifice he has arranged to be here with us this evening, though even now he has got to leave on a late train for Pennsylvania to-night. I hope we will make him feel well paid for coming. His address will be instructive as well as entertaining, and by his presence he will be doing a great deal for our Association.

President—You hear the remarks of our Secretary, and I hope that every member will heed them. We will now adjourn until eight o'clock this evening.

## FIRST DAY—EVENING SESSION.

At 8 o'clock P. M. the President called the Convention to order.

President—Mr. Secretary, is there any business to come before this meeting at this time?

Mr. French—Mr. President, there is but one matter. The General Superintendent of the Boston & Maine Railroad, Mr. Sanborn, has invited the members of the Association with their friends, to go out to Prison Point to-morrow morning, only about a mile distant, to see some of the new track work that has been done in connection with the new Union Station Boston Terminal. There we have two slips crossing each other in a distance of four hundred feet, some very fine track work. We will leave the Eastern Division depot on a special car at 8.30. And while we are there, as we have never had any group photograph of the members of our Association, we are going to take advantage of this opportunity. So we will probably be gone about an hour, and will assemble here about 9.30 to-morrow morning to have a session which will last until about one o'clock. Then the entertainment committee, jointly with the supply men, have arranged for a joint entertainment in the shape of a harbor excursion. We all get railroading enough during the year without taking a railroad excursion, so we are going out on one of the harbor boats to Bass's Point for social recreation. We will leave the wharf at 2.30, returning at 9.30, but those members who have got to get back in time to take an evening train for their respective homes can cross from Bass's Point to Lynn, and come in on any train, reaching Boston at half past five, six, seven or eight, as they may see fit. We hope that you will keep these two engagements so that we shall have a successful trip in both cases.

President—Gentlemen, we have with us to-night, a man of wide experience in the manufacture of rails, who will address us, and I know you will be interested in what he will have to say. I now have the pleasure of introducing to you, Mr. Dudley, of New York. Mr. Dudley would be glad to have you ask him any questions as he progresses, and will be pleased to answer them, rather than to wait until after he gets through, perhaps, and be compelled to go all over it again.

## ADDRESS OF P. H. DUDLEY, C. E., ON MANUFACTURE OF STEEL RAILS.

Mr. President and gentlemen of the New England Roadmasters' Association, it gives me pleasure to meet with you to-day to consider Bessemer steel rails and track, matters in which we are not only deeply interested, but which are of such vital importance to the great railroad interests with which you are connected.

It is especially opportune, for with many of you I have made common efforts for many years to improve the railroad tracks, bringing them up to a high standard of efficiency for present needs of transportation. We may briefly review that work which has led directly to the manufacture of high-grade steel rails for present service.

The diagrams taken by my car of your tracks years ago, were supposed by many to indicate only a very general condition of the track, and principally referring to your care of it.

The diagrams being taken by a positive basis of measurement, and further being summed up mechanically, their study and analysis indicated very clearly the "condition of the steel," and enabled me to approximately point out how much improvement could be expected by labor, and, if more was desired, it must come from material.

This was the first important result of many years of toil on my part.

The constant repetition from year to year of the "condition of track" per mile on the condensed diagrams clearly indicated whether the rails were smooth, or wavy, or irregularly worn, with small or large deflections, and you were no longer expected to make a track of imperfect rails equally as good as that from the best rails. Your work was more thoroughly appreciated, to which you quickly responded, and aided by the marking of the deflections under my car; improvements in surfacing were soon followed by a reduction of some of the long bends in the rails.

The condensed diagrams were yearly reducing to the "condition of the steel" per mile, and for the past few years some of your tracks have been as smooth and stable as the rails and their condition permitted. With smooth rails your tracks attained a definite standard, rising higher as their stiffness increased.

This is very nicely illustrated by the Boston & Albany diagrams and a great many others that I have. When I first made these diagrams the railroad company said that if I pointed out to them any particular miles in which the lines were high, they thought by putting more labor upon those sections they could reduce them to the best miles in the track. It was found after three or four years' trial that these diagrams repeated themselves. If the rails were raised, they were never able to reverse a curve in any of these lines, although they might improve the track. And now for the last few years it is shown on these diagrams how low they can reduce the lines showing the general condition of the track; if the rails are badly worn, the lines remain high, and the instant they renewed the rails the lines dropped down as low as their condition permitted. Perhaps it may be difficult for you to see, but on this diagram you will notice the line for the upper track down very near the base there, and every portion where they renewed the line it has dropped down fifteen or twenty points. That really is the most important work of the diagrams, showing the condition of the steel; if they wanted to improve the track in any of those miles within the last few years, it has been done only by a renewal of the steel, and was not a question of labor.

If the rails were rough from poor finish in the mills, or irregular wear in service, it was reflected on the condensed diagrams, while with more recent specially-made smooth, stiff rails, your tracks have now reached a standard not considered possible a few years ago.

No one factor has contributed more to the fine tracks of to-day than the so-called "Bessemer steel rails," and rendered possible the development of our vast railway system.

It is, without question, the most important metallurgical invention of modern times, and ranks with the great inventions of printing and steam.

It is a striking example of slight changes in amounts of the elements producing great changes in the physical properties of the metal.

The rapidity with which the steel can be made, its qualities and cheapness have brought it into extensive use.

With profit we may briefly notice some of the reasons and steps which have led to its invention. A steel rail today which will carry the wheel pressure, both as a girder, and without undue flow and abrasion, is one of the important matters which railway men must consider. Iron combined with one per cent. of carbon or less, forms steel, and when well worked has a tensile strength three to four times that of the iron from which it was formed.

The ordinary condition of the steel would be much harder than iron, and its hardness could be very much increased by heating it red-hot and cooling it quickly, rendering it suitable for tools and many purposes for which iron is not adapted.

The small amount of carbon added to the iron more than trebles its commercial value in the fine steels, while it permits a ton of the grade of rail steel to be made for less cost now, than a ton of wrought iron. The carbon added to the practically infusible wrought iron lowers its melting point —so it can be readily fused—an important feature.

Iron is a metal, while carbon is non-metallic, and now called a metalloid.

Carbon is capable of assuming many conditions ; opaque black, semi-metallic, as graphite or black lead ; velvety and porous as wood charcoal ; also forming the basis of soft coal, anthracite, coke and gas carbon, and further the sparkling, transparent diamond.

Singular as it may seem, carbon is one of the essential elements entering into combination with hydrogen and oxygen, and a few mineral salts, to build up the structure in both animal and vegetable life. The wood of trees forms the basis of supplies for carbon, as charcoal.

Now, take charcoal and reduce it to powder, and imbed bars of iron in it, and heat only to redness, or slightly above, and some of the carbon enters and unites with the iron by a process called cementation.

The nature and structure of the iron has been entirely changed, although the iron has not been melted.

The fact that heat induces changes in the structure between iron and carbon or steel at temperature below fusion cannot be overlooked in making rails. It causes the large, deep heads to build up a coarse, weak structure after leaving the finished pass of the rolls.

I have some samples here. Here are some of the heads of the Boston & Albany, and you will see that the texture in these broad heads and thin heads, being well worked by the rolls, is almost as fine as anything you saw in the first steel rails that you laid ; it is even as fine as it is in that old John Brown rail.

The process of cementation was the principal method of making steel before the Bessemer process came into use. Its output, however, is very limited, requiring from ten to twelve days to impart the carbon to the bars of iron, forming what was called blister steel, which, when piled, welded, and drawn out, forms shear steel.

When the bars are broken up and melted, and cast, the product forms cast steel, from which your track chisels and most high grades of tools are made. The process is too slow and expensive for steel rails.

## PIG IRON.

In the blast furnace, the ores of iron as oxides can practically only be reduced by one agent, carbon or carbonic oxide—another feature of the great utility of carbon. A very high temperature is required to effect the reduction, and the iron takes up some of the reducing agent as well as silicon, sulphur, phosphorus, manganese, and other elements which may be found with the iron ores, or are in the fuel or fluxes, so that pig iron is never pure, and the carbon is in two forms or conditions.

There are different grades of iron made at different times from the same furnace according to its manner of working, as gray, mottled and white. These are often called Nos. 1, 2, and 3, respectively. The analysis of the iron as given below, can only be taken as very general.

| | Gray. | Mottled. | White. |
|---|---|---|---|
| Iron | 90.24 | 89.31 | 89.86 |
| Combined carbon | 1.02 | 1.79 | 2.46 |
| Graphite | 2.64 | 1.11 | .87 |
| Silicon | 3.06 | 2.17 | 1.12 |
| Sulphur | .11 | .15 | .25 |
| Phosphorus | .09 | .12 | .09 |
| Manganese | .83 | 1.60 | 2.72 |
| Copper | .20 | .10 | .30 |

A more extended analysis would show other impurities.

It will be noticed the combined carbon increased in the mottled, and is much greater in the white iron, and on the other hand, the graphite is greater in the gray, decreasing in the mottled and white iron.

The silicon is the largest in the gray, decreasing in the mottled and white iron.

The total carbon in any of the irons is several times more than is required for steel rails—and it is but natural that some one should think of reducing the carbon in the pig iron to the proper amount, and steel would be obtained.

To make iron rails the pig iron has to be reduced in a puddling furnace, a puddler and helper turning out from one to one and a half tons of muck bar per turn of twelve hours.

This muck bar was repiled for the best iron rails. The output even of a large plant being limited and expensive.

Bessemer, of England, wishing to find a better material for ordnance and projectiles than cast iron, conceived the idea of blowing air through the molten cast iron, the oxygen of the air uniting with the carbon, and he expected to burn out all the carbon not required to form steel. His patent was taken out in England, in 1855.

Designing special converters for the work and using very fine pig iron, his early experiments were quite successful; a large number of firms, licensed to produce his steel, however, not using as pure pig iron as he did, the product was very inferior, and his process was pronounced a failure.

Bessemer had produced a good grade of metal once. He saw no reason why it could not be done again, and at once set about finding out why he had failed.

Briefly, it may be stated, owing to impurities in the pig iron, all kinds are not suitable for Bessemer steel, and it was soon found that, instead of trying to stop the conversion where the carbon was just the proper amount, it was best to remove it all, and then re-carbonize the molten metal. This, the great crucible steel maker, Mushet, proposed, and it is now the practice in all countries, except Sweden, where their pure charcoal iron contains sufficient manganese for them to stop the blow at the right point, and secure a good product without re-carbonizing.

In the Bessemer process, the impurities, sulphur and phosphorus, are not removed from the iron, but, on the contrary, the steel seems to absorb all that is in the fuel, and as the impurities ought not to exceed a certain amount, the ores or pig irons suitable for making Bessemer steel are limited.

The analyses of the ores already given shows that either one of the irons contain too much sulphur and phosphorus to be used alone for rails, and can only be used in small quantities for the cupola mixtures, with irons which were lower in those elements.

The pig irons are re-melted in cupolas and the pig iron mixtures are usually of two or three brands, and one or more grades from the same brands, in order to give an iron mixture not exceeding the limits of the phosphorus and sulphur, and yet have enough silicon to blow hot enough to carry a certain percentage of scrap. Spain, New York and Pennsylvania would contribute ores for the needed irons, and the mixture of irons being melted in the cupolas, they are tapped into a large ladle, which weighs the amount of iron received.

This ladle, holding eight to ten tons of molten iron, is run by a small locomotive to the mouth of the converter.

The Spielgeleisen re-carbonizer, containing the proper amount of carbon, manganese and silicon, is also melted in cupolas.

The Bessemer converters or vessels are rated according to the number of tons of metal they can convert at one operation, as 5, 7, 10 or 12 ton vessels. They are large wrought-iron shells lined with fire-brick and ganister ore, mounted upon hollow trunnions through which the air enters to the tuyeres in the removable bottom. The vessel is turned down to receive its charge of a ton or more of scrap, and nine or ten tons of molten metal, and then up for its conversion by hydraulic power as though it was a mere feather. The blast of air of twenty-five pounds pressure per square inch is turned on before the vessel starts to turn, and as it moves over and up, a shower of sparks fill the air and the converting house. The nose of the vessel blows up the great chimney ; the molten metal being under violent agitation, the silicon is first attacked, and then the carbon, and in nine to twelve minutes the vessel is ready to turn down, receive its mixture of re-carbonizer of Spielgeleisen, pour its tons of molten steel into the casting ladle, which in a minute or two is run over the ingot molds in the casting pit. The molds are cast iron, two and a half to three inches thick. The ingot when cast will be similar in general appearance to the representation of one before you. This is fifteen inches square at the base, five feet long, and tapers to the top, being only twelve and one-half inches square. Many other sizes are in use, and the ingots would be shorter or longer according to the weight per yard of the rails, and the number of lengths per ingot to be rolled. The ingot must have a large draft so the molds will not only strip readily, but to prevent cracking horizontally on the surface near the butt, or top of the ingot, while cooling in the mold. For this reason short ingots are preferred, and the practice of making shorter and larger ingots is becoming more common. Ingots sixteen inches by nineteen inches, four and one-half feet long, are used at one mill. Formerly all molds were set in a semi-circular pit, and this is still the practice of many mills, the steel being poured from the converter to a ladle which can be turned around over the ingot molds in the pit by hydraulic power. In the bottom of the ladle near the front there is a two-inch orifice provided with a stopper which can be closed or opened by a lever attached to the outside of the ladle. It is through this orifice the molten white-hot steel descends vertically in a solid stream into the mouth of the ingot mold. It is very important that this be done without spattering the sides of the ingot much, for in that case the spattered metal chills on the side of the mold, and may not be re-melted by the rising steel filling the mold, and a scabby ingot results. The steel strikes the bottom of the mold, and then as it rises, if it spatters very much, there would be a great many scabs left upon the sides of the ingot. That is one thing that we are extremely particular about, not to have any spattering of the molds to any great extent, because that immediately oxidizes, and does not close and weld up in subsequent rolling. Little portions of metal would be all over the mold on the outside of the ingot. At the extreme top there are likely to be a few scabs which are cut off in cropping the bloom. It takes from five to seven minutes to pour about ten tons of steel into seven ingot molds. The thick iron molds abstract the heat quite rapidly from the hot metal and it commences to set, solidifying in a minute or two and in twelve to fifteen minutes it is set so the molds can be stripped from the ingots. The steel in the ingot mold emits sparks, and often rises as before stated, and sand is thrown on the top, which is also often chilled with water. We always like to see the steel set quietly. The molten steel is only prevented from setting, by the intense heat over-balancing the crystalline forces which become predominant as the steel cools, and form stuctures in all parts of the ingot. You are familiar with the texture in steel rails which you designate as fine or coarse when you cut and break them. As the steel cools, it becomes a mass of more or less imperfectly-formed crystals, and different portions of the same crystal are not alike. I have a photomicrograph, magnified fifty diameters, showing the structure in a steel ingot, after being polished and etched.

You may notice that the would-be crystals are in a crowded condition, and are very small. If the crystals were well defined, the steel would be weak. The ingot was fourteen inches square, and that is one reason why the structure is so small. If the ingot was larger, the steel would have been coarser. It is very important to secure as small crystals in the ingot as possible by its size and chemical composition, for we must principally depend upon the further reduction of the crystals by the mechanical work of the few passes in the blooming and rail-trains of the modern methods of rail-making.

The structure through the entire ingot is not the same, being quite different in the center from the sides of the ingot. On all sides of the ingot in contact with the mold, crystals arrange themselves at right angles to the sides of the molds in lines an inch or more in depth.

If we should cut our ingot vertically through the center, the crystals would appear in lines something as I have represented on this model of a fifteen-inch ingot. This is called the columnar structure of the ingot, and in which are the exterior blow-holes ; many of them are open to the outside, and their walls become oxidized. This structure also contains the skin cracks due to the more rapid contractions of the exterior of the ingot during solidification. Beyond the columnar structure and toward the center of the ingot, the structure is more polyhedral, the crystals no longer in lines, but as a great mass which may contain many gas-bubbles—increasing in frequency as you reach the center of the ingot. An effort is made to select irons and compositions for the steel which form but few blow holes, the steel setting solid. I have a small piece from a sixty-carbon ingot which does not show a blow-hole from the side to the center. The sides of the ingot cooling first becoming quite rigid, the shrinking metal draws away from the center of the ingot, making a tendency to form a pipe, especially near the top of the ingot. I have indicated on this model, a pipe in the center of the ingot, which sometimes forms, and has always been a serious matter ever since steel rails were made, and will continue so long as steel must be cast in ingots. The best practice now keeps the ingots hot and charged into the heating furnaces, and thence to the blooming train with as little interruption as possible. In this way many of the possible pipes are closed and welded, provided their surfaces had not become oxidized. In steel rails, the ingots being much smaller, become much colder, and sometimes entirely cold before being charged into the furnaces. The pipes, while they closed up, did not weld, and they endeavored to remove them by cutting off the top of the ingot. This was not always effective, as you know by the number of split heads you had in the early rails. I was recently quite surprised to see the great number of split heads of early rails sold as old scrap by one railroad. If we look at a transverse section of an ingot, we would see how the columnar structure intersects at the corners, which I have tried to represent on the bottom of the model. Where the lines from the two sides meet near the corners, gas bubbles are formed, which in some ingots become disengaged ; the steel rising breaks through the top crust, as a little volcano, each escaping bubble of gas forcing up molten metal building up and making the craters two or four inches high before it can be chilled.

The small pipes or gas cavities under these little volcanoes are often oxidized, and not welded in the subsequent rolling. Rails from such ingots, after being worn down on the surface of the rail, have large pieces flake out or flow, and the inside edge of the rail becomes very ragged and rough.

## COMPOSITION FOR RAILS.

Fifteen or twenty years ago, about the only chemical composition specified for a steel rail, was as to the carbon contents, which were from .30 to .40 of one per cent., the rest of the composition being left to the maker.

When the ingots were small and hammered, the blooms rolled into rails much colder than now with a great many more passes in the rail train, the metal received so much more mechanical work, the small sections and the light traffic, the rails rendered excellent service.

As the demand for the rails increased, the mills were obliged to increase their output, and it was a question rather of quantity than of quality. The early steel rails already in service were so enduring, a conclusion was soon reached that the place to put the metal for wear, was in deepening the head, and sections of rails with deep heads were introduced, which, as many of you know by experience, were put into the tracks adjacent to the early rails, and the deep heads have worn out faster under the same traffic than the early type.

Then the conclusion was reached that the chemical composition was the proper basis to work from to make a good rail, and many of the best wearing rails were analyzed, and the results prescribed for the composition of rails. As must be expected, there was a wide variation in the different elements, as follows :

| | |
|---|---|
| Carbon | .30 to .45 |
| Manganese | .48 to .88 |
| Silicon | .02 to .15 |
| Phosphorus | .05 to .13 |
| Sulphur | .06 to .15 |

This in the deep-headed sections did not wear as formerly in the light sections. When the structure of these sections was examined, it was found to be quite different, the early rails being fine, and in the later rails coarse.

In common with many others, I proposed to increase the carbon in the rails, and start with a higher grade of metal in the ingots, to obtain in the finished rail a finer structure with the much less mechanical work of modern processes of rolling. Each different weight of section requires a slight difference of composition.

I give in tabular form the chemical composition I use for my sections, adopted from the Boston & Albany composition, which will be described later.

WEIGHTS PER YARD.

| | Lbs. 60, 65 and 70. | Lbs. 75 and 80. | Lbs. 100. |
|---|---|---|---|
| Carbon | .45 to .55 | .50 to .60 | .65 to .75 |
| Manganese | .80 to 1.00 | .80 to 1.00 | .80 to 1.00 |
| Silicon | 10 to .15 | .10 to .15 | .10 to .15 |
| *Phosphorus. | .06 | .06 | .06 |
| *Sulphur. | .07 | .07 | .07 |

---

*Not to exceed.

In the specifications there is now inserted the following clause, which gives us an opportunity to meet conditions which may occur from day to day in making the rails:

### SPECIFICATIONS.

"From the results of the inspections of the rolling of the ingots, blooms, and rails, and from the drop tests, the inspector for the railroad company in charge of making the rails, shall have the right to select the minimum or maximum limit of either the carbon, silicon, or manganese, or the three, as the general guide for the composition as he may consider the finished product requires to produce a tough rail with as dense fine grain heads as possible by the plant of the manufacturer."

Some days we have had much more difficulty in securing a dense structure than others, on account of some impurities in the pig iron, something not shown by the chemical analysis. Perhaps we may have to increase the manganese slightly, and the next day cut the carbon down three or four points. We ascertain that by the drop tests, and when we find we have not a good composition, we modify the chemical composition at once.

From the analyses of the different iron already given, there were given Carbon, Manganese, Silicon, Sulphur, Phosphorus and Copper. We might say a more complete analysis might add Arsenic, Cobalt, Chromium, Tungsten, Aluminum and Nickel, or traces, at least. Our steel will be a very complex alloy or mixture. The percentages of carbon, manganese and silicon, are specified within certain limits, while the sulphur and phosphorus must not exceed certain limits.

Carbon by itself up to over one per cent. increases the hardness and tensile strength of the iron rapidly, and, at the same time, decreases the elongation. The amount of carbon in the early rails ranged from .25 to .50 of one per cent., while in recent rails, and very heavy sections it has been increased to .50, .60 and .75 of one per cent. With good irons and suitable sections it can run from .55 to .75 of one per cent., according to the section, and obtain fine-grain tough rails with low phosphorus.

Manganese is a necessary ingredient in the first place to take up the oxide of iron formed in the bath of molten metal during the blow. It also is of great assistance to check red shortness of the ingots during the first passes in the blooming train. In the early rails .40 to .50 per cent. was sufficient when the ingots were hammered, or the reductions in the passes in the trains were very much lighter than to-day. When these were hammered under a steam hammer, it did not require so much, because they could coax the ingot, and if it had a tendency to crack they could make the blows of the hammer very much lighter, and draw the ingot out without cracking. With the more rapid rolling of recent years, the manganese was very often increased to 1.25 to 1.50 per cent. It makes the rails hard with a coarse crystallization, and with a decided tendency to brittleness. Rails high in manganese seem to flow quite easily, especially under severe service, or the use of sand, and oxidize rapidly in tunnels. The bright-wearing surface must also be affected anywhere the rails are laid in the track. From .80 to 1.00 per cent. seems to be all that is necessary for good rolling at the present time.

Silicon makes the steel lie very quiet in the molds, producing very solid ingots when present in .10 to .25 of one per cent. It tends to make the crystallization small, and in this way contributes to good wear. Some mills have not been able to increase the silicon over .10 of one per cent. without making the steel brittle, while others can run as high as .30 of one per cent. and the rails increase in toughness. So great difference in practice has led to as decided opinions in regard to the values of silicon. There should be no residual silicon left in the blown metal ; it should all be added in the re-carbonizer. From .04 to .06 of silicon has been the common practice, but it is not sufficient for present traffic. The early practice was far better, as .08 to .10 was used. Some of the earlier rails had from .30 to .40 of one per cent. of silicon, and low carbon .25 to .35, and the good wearing qualities were attributed to the silicon. The structure of those rails indicates, so far as I have examined them, that their methods of manufacture had much to do with the resulting structure which wore so well. This is, however, a matter which will require extensive investigation, and there are but few laborers in the field.

Sulphur and phosphorus are two impurities which are very objectionable. Sulphur makes the steel red short, liable to crack in rolling, and checking the welding of the the blow-holes and pipes. Any little blow-hole that can come to the outside of this ingot, with a large amount of sulphur, will form a very small seam, impossible to weld, and close it up solid. The limit of sulphur is now specified from .07 to .12 of one per cent., the difference between the lower and upper limit will increase the number of seamy heads in the rails ; oftentimes in my experience, doubling the percentage of seconds on account of the seamy heads. We would have to reject a large number of rails, because they would be full of minute seams in the head, by a slight increase in the sulphur. Rails with .50 to .55 of carbon, .07 in phosphorus and .12 in sulphur do not seem to be brittle under the drop test, but very tough, as a rule, when rolled in my sections. That is one very surprising thing. I have often tried to break one to show how deep the little seams were, and we would have to drop our ball, weighing 2,000 pounds, twenty-one feet, and have to drop it twenty times before we could break it. It is remarkably tough. I am unable to speak for other sections. Most manufacturers do not consider that sulphur hurts the consumer as much as the manufacturers. A seamy head in a rail is not to be desired though the seams may not be over 1-32 to 1-16 of an inch in depth. Flow of metal can occur from a seam under the wheel pressure much easier than from a solid head. I can go along in the track and see those rails that have a large amount of sulphur There will be very fine scales that have started from each one of those seams. I can pick them out very readily. Phosphorus increases the size of the crystallization, and makes the metal brittle, and liable to break in cold weather. The percentage now allowed in rails ranges from .06 to .11 of one per cent.

Arsenic is found in some irons, and is regarded as an impurity as sulphur and phosphorus, and in some cases it has been considered to render steel brittle like phosphorus.

The amount is not limited in the specifications.

In rails having .03 of one per cent. of arsenic phosphorus up to .06, and the carbon up to .60, the rails stood the drop test without indications of brittleness.

Copper makes the metal red short. It is not limited in the specifications, and ranges from .10 to .75 of one per cent. Rails having copper from .35 to .70 have stood the drop test. The seconds may increase with high copper. Some of the low phosphorus ores carry high copper.

Nickel traces of this metal are often found in rails.

This metal, so abundant in meteoric irons, has long been noted for its decided modifications of the structure of the iron.

Three per cent. combined with steel, for armor plates, increases the ductility of the metal, so it will stand the penetration of projectiles, and absorb their energy without cracking the plates. By increasing the carbon in one side of the plates, making them harder, the projectiles will be broken into fragments, as shown by the illustrations of the trial of a Harveyized nickel armor plate made by the Bethlehem Iron Company.

I have detailed at some length the characteristics of each element entering into the composition of a steel rail, and you can readily see that the mixture of all these elements would in any case be very complex. Some of the elements have stronger affinities than others, and in the crystallization or building-up of the would-be crystals or mineral aggregates throughout the mass of the metal, those of the greatest affinities will unite, though they must inclose and surround others with little union; and we may have our mineral aggregates united feebly if the crystals are large, while they would be stronger if smaller, as a rule.

Now, whether the crystallization of a given composition be fine or coarse, depends to a great extent upon how rapidly it may be cooled in the ingot, small if rapid, and large if slow.

The structure will be broken up to some extent in the subsequent rolling of the rails, but if finished at a high temperature, a large-headed rail will form a coarse structure during cooling. Simply from the fact that it has so much heat that the rollers do not extract the heat, and it is utterly impossible for this heat to reach the air, and the center of the rail builds up a coarse structure.

The physical properties of a given composition for a rail largely depends upon how fine and firm a texture we can produce in the finished head of the rail.

You are quite familiar with the fine texture shown when you cut the older rails, as compared with the coarser structure of the deeper-headed rails which succeeded the first sections of steel rails you laid. You are also familiar in the severe service, how much faster the coarser-textured rails were as compared with your first steel rails. Of course we must consider that the severity of the service has been increasing from year to year, which also increased the rate of wear on all rails. Yet this wear has been the slowest on the fine-textured rails.

I have photomicographs magnified fifty diameters of etchings of the early rails, and subsequent deeper-headed rails.

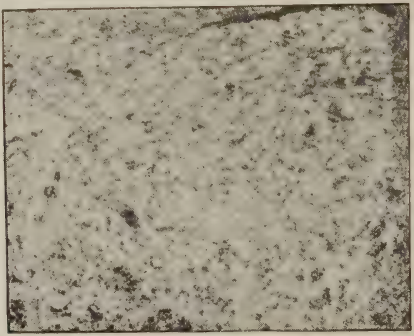


*Fig. 2.*

Fig. 2 is from a Cammell rail in service seventeen years on the N. Y. C. & H. R. R. at Manhattan, which shows a very fine and firm structure. It is a very compact structure; and the would-be crystals or mineral aggregates are not large or well-defined, but each one is so thoroughly interlocked with its neighbor that it is difficult to break it down,or any flow of its constituents taking place.

The breaking down of the surface under the wheels was less than 1-100 of an inch in depth, and can just be traced in the top of the cut.

Flow of the metal was exceedingly slow, and we can include all of the earlier brands of rails as showing a very similar structure.

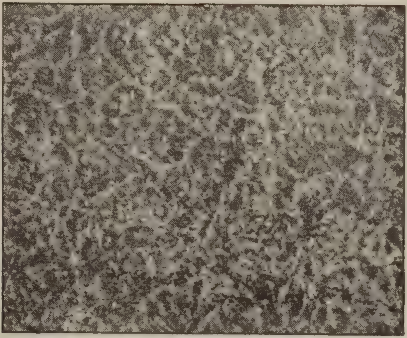


*Fig. 3.*

Fig. 3 is from a deep-headed seventy-two-pound Boston & Albany rail. The structure is many times coarser and not so fine. The crystals or mineral aggregates are more clearly defined, and indicate at once that the boundaries of the aggregates are unlike the central portions. The carbon has not united with all of the iron, and this free iron has been named Ferrite, and is composed of thin layers.

When there is some carbon absorbed by these layers it is called pearlyte, and when the carbon is much increased it has been called cementite.

Where all the manganese, silicon, sulphur, phosphorus, copper, and other impurities are distributed in these minearl aggregates has not been ascertained.

The important fact, however, that under heavy pressure they break down and flow in these layers is well ascertained.

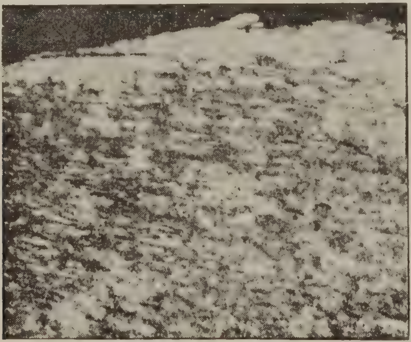


*Fig. 4.*

This may be seen by reference to Fig. 4, which is an etching from the same rail as Fig. 3, showing how the surface of the rail under the wheel pressure is broken down, and flows off in these layers.

Examine the surface of such a rail in the track by a microscope, and we find a series of scales overlapping each other, the thin edges being reduced to powder, or broken from the rail, or a mineral aggregate flaking out.

You can see fragments ready to be detached from the top of the rail in the Fig. 4.

When the flow takes place in larger masses, they become detached from the side of the head as shown in Fig. 5.

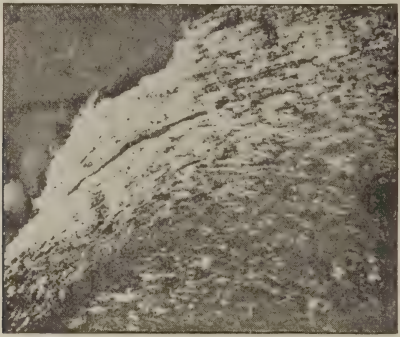


*Fig. 5.*

The comparison of the structure and wear of the early rails with that of the later deeper heads shows that the wear and deformation of the rail section largely depends upon whether the metal has great resistance to surface flow or flows readily under the wheel pressures.

The many years of experience with steel rails have clearly demonstrated that those which flow the least under the wheel pressure give most service, and those that flow the most, wear and abrade with the most rapidity. This same remark applies to the flange abrasion on curves. As I have already stated, the most serviceable rails had a fine structure and small mineral aggregate.

The less serviceable have a coarse structure and large mineral aggregate, though in many cases the so-called chemical composition was identical.

In the language of a constructor of ordnance, the condition of the metal for the grade of its composition was better for the service in the older rails, than the condition of the metal in the later rails for their service.

We have already mentioned that the structure in the steel may be modified by heat much below fusion, and now state that the thick, deep heads of the rails would be so long in cooling from the high temperature of the finishing pass, the structure would become very coarse.

As it is now well known, it is over ten years since I made a broad, thin head for rails of heavy sections. So the roll pressures and rapid cooling would contribute to make the structure finer and more homogeneous in that shaped head than was possible to secure in the deep-headed type then in general use.

In the past nine years, the N. Y. C. & H. R. R. Co. put 80,000 tons of my first 80-pound section into trunk line service, and notwithstanding over fifty per cent. increase in the wheel pressure, the rate of wear of these rails has been very small. Many railroads, seeing its good wearing qualities, copied the thin head so it is now a prominent type.

Since I designed the 80-pound section ten years since, even then, for special stiffness and hardness the average weights upon the wheels have increased .40 to .50 per cent. and the rail requires a much higher grade of metal in the rail heads, to resist flow and abrasions. Several attempts were made to have more carbon than ordinarily was used put into the rails of a section. The efforts were frustrated by making the rails brittle. There are two or three miles of rails which have been in the tracks four years with .70 carbon, which show little wear.

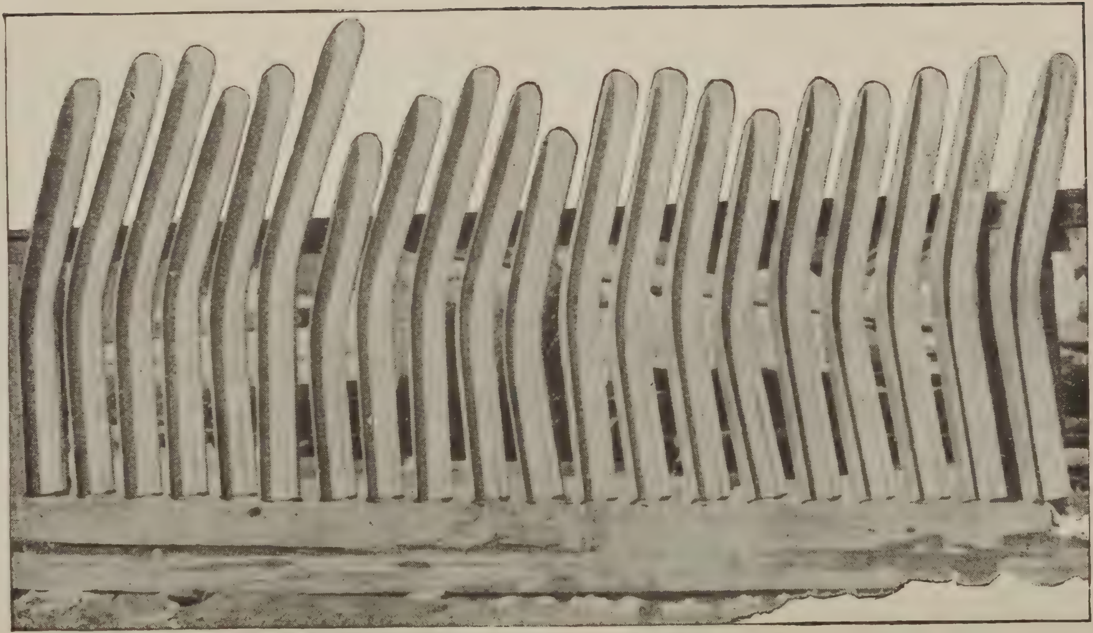
In 1890, I introduced a series of rail sections of different weights, especially designed to produce a tough, fine structure in the heads by the modern process of rolling. Also as special 95-pound rail for the Boston & Albany R. R.

It was long ago observed that as the weight of the section increased the difficulties of producing a fine structure in the head were also increased.

In order to secure a fine structure, in my large sections especially, the Boston & Albany 95-pound, I proposed the following composition:

| | |
|---|---|
| Carbon | .60 |
| Manganese | .80 to .90 |
| Silicon | .10 to .15 |
| Phosphorus, not to exceed | .06 |
| Sulphur, not to exceed | .07 |

While great doubt was expressed as to the possibility of securing toughness with so high carbon, we are able to control the condition of the metal in the final product of the rails, so that they were of unexpected toughness. The butts stood a drop test of 2,000 pounds, falling twenty feet



DROP TEST OF THE "D" BRAND OF HIGH CARBON RAILS.

The cut shows 20 tested butts out of 34 of one morning's tests of the 75-pound rails—no failures.

The 80-pound or the B. & A. R. R. 95-pound tests would be similar, but the deflections would be less.

Ninety per cent. of the butts must stand the drop test, and those which break must give five to six per cent. elongation per inch, or the rails of those heats are rejected.

Before testing the butts at least six one-inch spaces are stamped directly under the point of impact of the drop, from which the elongation of the metal can be determined under shock, whether the butts stand or break.

and rarely broke, while hundreds stood two to four blows of thirty feet before failing, supports four feet apart.

At the side the flange gave 16 to 18 per cent. elongation per inch under the point of impact of the drop. It, however, must be said to the credit of President Bliss, of the Boston & Albany Railroad Company, that he was willing to meet the manufacturers in a fair spirit, and pay an increased price per ton for the high carbon rails.

I have no hesitancy in saying that it is the most important work yet undertaken to improve the quality of steel rails for present service. The contract for the first 16,000 tons of the ninety-five-pound rails was let to the Bethlehem Iron Company. Every effort was made by them to make the rails tough, and in this respect they were as agreeably surprised and gratified as any one.

Dr. Webb, president of the Mohawk & Malone Railway, had 2,000 tons made upon the same formula as the Boston & Albany, ninety-five pounds, and 21,000 tons in .50 to .55 carbon.

Early in 1892, the N. Y. C. & H. R. R. adopted the high carbon formula for their rails, both for the 80-pound, and the new 65, 70, 75, 80 and 100-pound sections they adopted from my series.

The Central Vermont 75-pound, and the Buffalo, Rochester & Pittsburg 80-pound sections are made about on the composition given in the tabular statement.

To date, over 150,000 tons of these high carbon rails, in my series of sections of 60, 65, 70, 75, 80 and 100 pounds have been rolled. About nine-tenths of product being in the weights above seventy pounds.

### SEGREGATION OF THE ELEMENTS IN THE INGOT.

So far in the discussion of the composition of the ingot we have not alluded to any variation for any portion of the ingot.

As the steel cools first in contact with the sides of the mold, those crystals crowd out some of the carbon, phosphorus and sulphur, to the more fluid metal in the center of the ingot, the top often having more carbon, sulphur, phosphorus and manganese than the average of the ingot. The top rail is liable to be more brittle than the other rails in the ingot. This metal in the top portion being the last to cool as this structure is formed, it seems to force out more of the carbon and the phosphorus, and this upper rail would get more than the usual amount ; and the larger the ingot, the greater this separation of aggregation appears to take place.

I have the top rail of the ingots marked A, the second B, the third C, and the fourth D.

In a number of rails of old sections broken in the track last winter, their structures indicate that they were the top rails. I had a great many rails to examine last winter, sent from all parts of the country, that were broken, and in every instance I found, so far as I could tell by my examination of the structure, that they were all from the top rails of the ingots.

This is one of the reasons why we must keep the phosphorus low in the high grade steels, so it will not be too high in the top rail.

### HEATING THE INGOTS.

The ingots, of which we described the pouring, were charged into horizontal heating furnaces at Bethlehem, Pa., and at Scranton, Pa. At the former place oil gas is used for heating, and at the latter small coal.

The object of the heating furnaces is to more thoroughly equalize the heat between the interior and the exterior of the ingot.

The entire ingot wants to be brought to a soft, mellow heat, but should not be overheated, as the crystallization is then so strongly developed as to render it difficult to break it up in the subsequent rolling. If in heating this ingot they produce crystallization, with well-defined crystals, and are unable to break it up, those rails would be very brittle, and have to be rejected. Under the drop test we would find these indications very quickly. The steel may also be burnt, in which case it rolls badly, is brittle, and should be rejected.

Heating the ingots is one of the very important steps in the manufacture of the rails, and must receive good attention, as otherwise a good grade of steel can be rendered weak and brittle.

### BLOOMING THE INGOTS.

In your early rails, the ingots were formed into blooms under a steam hammer, but now they are rolled. At Bethlehem, the ingots were bloomed in a 24-inch three high train, and in eleven passes reduced to a 7¾ inch square bloom.

A three high train means there are three rolls in the same pressing, one above the other, the engine driving them running constantly in one direction, and at a given speed. A table elevates the ingot to the pass in the rolls running in the right direction to roll, as it must pass back and forth for each reduction.

It passes first through the lower rolls, and then it is raised and comes back through the upper; then it drops down, goes through, is raised again, and comes back. At Bethlehem, there were eleven different passes through which this was passed before it was reduced to this size.

From the blooming table the bloom was carried to a steam hammer, when the top or sand end was cut off, and any skin cracks chipped out of the bloom, then cut into rail-lengths, and re-charged into furnaces, and re-heated for rolling into rails.

### ROLLING THE RAILS.

After the blooms were thoroughly re-heated, the blooms were run to a three-high, twenty-three-inch rail train, the blooms or partially-formed rail guided to each successive pass by catchers with hooks. Eleven passes were required, and less than one minute after the bloom entered the first pass it came out of the last pass a finished rail. The high .60 carbon rails are very hard on the blooming and rail trains, frequently breaking the blooming and roughing rolls, and rapidly wearing the finishing rolls. The repairs are more than doubled over .45 to .50 carbon rails.

At the Lackawanna Iron and Steel Company's south works at Scranton, the blooming and rail trains are 33⅝-inch two-high trains, the driving engines reversing for each passage of the ingot bloom a partially or formed rail, only seventeen passes being required from the ingot to the finished rail, and are rolled at one heat.

The bloom is cropped, but chipping of the ingot is omitted. The rails are rolled in three or four lengths, according to the weight per yard, while at Bethlehem, any sections over sixty pounds are rolled in single lengths at present.

### SAWING THE RAILS.

From the finishing pass, the rails are run to the saws, which for the Boston & Albany ninety-five-pound sections are set about 30 feet, 6½ inches, so the hot rail will shrink to thirty feet when cold.

In the direct rolling, as at Scranton, the top rail is cut the longest, each succeeding one being reduced about one-eighth of an inch. This does not always insure the proper length, and some are re-cut when cold by a toothless disc running at a high velocity.

### CAMBERING THE RAILS.

From the hot saws, the rails go to the cambering machine, and are cambered. The rails of my section only require from six to seven inches camber, while the deep-headed rails, like the Boston .72-pound rails require twelve to thirteen inches. This is a very important factor in making tough and smooth rails.

### HOT-BEDS.

From the cambering machine the rail goes to the hot-bed, and here wonderful phenomena take place.

The rail, while still hot, is forming structure as it cools. The base, as it passes through a certain temperature, expands instead of contracts, straightening the rail, which then is turned over on the hot-bed ; the base still expands and curves the rails around the head, until the camber is nearly as much in the opposite direction as it was cambered.

The head now cools, expands, the base possibly contracting, straightening the rail, and then recurves as it was cambered, sometimes more than the original amount, then as both the base and head cool, the rail gradually straightens.

To make a hard, tough rail, the head must be thin, so the heat will pass off almost as quickly as from the base, otherwise a coarse structure develops, a separation of carbon taking place, the head soft while the base is brittle.

I have the rails on the hot-beds spaced six to twelve inches apart, so they will cool rapidly.

### STRAIGHTENING THE RAILS.

From the hotbeds the rails go to the beds of the straightening presses.

The burrs on the ends of the rails, caused by the saws, are chipped off and filed.

The rails then go to the press, and the straightener runs the rail under the moving head, and directs his helper to gag a light or heavy blow, as he thinks is required.

The supports are from twenty-seven to thirty inches apart on the press, and to bind the rails requires a very severe blow, which will show in a short time in the track. I have had the supports widened, which injures the rails less, and are much smoother when in the track, but this is not enough ; the gag should not be applied to the heads of the rails, and a better and less injurious method of straightening rails is desired.

The rails are now measured for length, and if right are drilled and placed on the inspection beds.

### INSPECTION.

The heads are all placed upon the bed, and each rail head and flanges examined for any defects, seams, flaws, sand cracks ; if any are found, the rail is marked as a second, unless near the end, then as a cut off. The rails are now turned head down and the base examined.

### TEST BUTTS.

As the rails were being rolled, a rail butt was saved from each heat for the drop test, the heat number being stamped upon it.

Before testing, each butt is stamped on the base or the head, as desired, with a stamp having seven prick points making six-inch divisions on the rail. When the butt is placed on the supports and the drop of 2,000 pounds falls upon it we see how much elongation per inch it gives, and thus judge of the condition of the metal.

It would give in the center here about six per cent. per inch with one blow at twenty feet ; at thirty feet it would give about ten per cent.

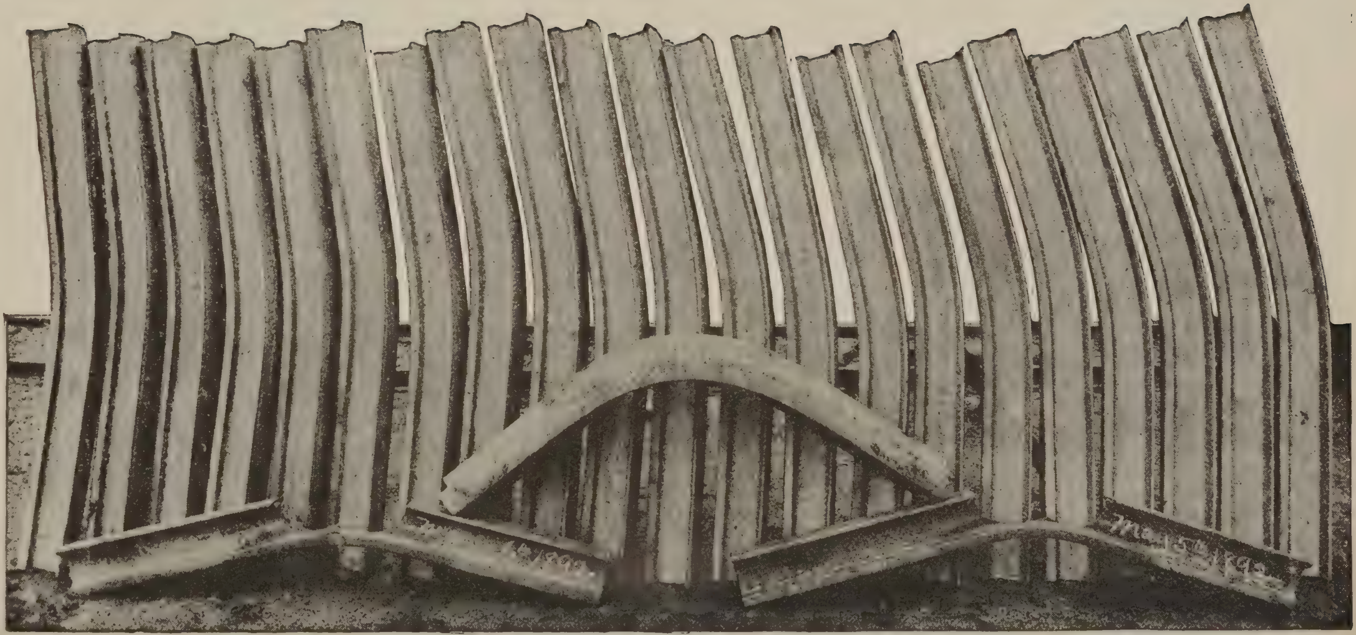
In case the rail breaks, the elongation can still be measured—and if it does not reach the prescribed limits, the rails of that heat are rejected. The drop test is the most valuable of any yet proposed to test the toughness of the rails.

Spacing the butt for six inches, before testing, makes out of the drop a testing machine unequalled in efficiency and rapidity for rail sections.

The information is valuable at once, and serves as a guide in the daily manufacture of the rails, checking the stock mixture, the blowing, re-carbonization, heating, and rolling the rails at a suitable temperature.

I have photographs showing how the different sections have stood the drop test, our rails having stood the drop tests prescribed, and ready for loading and shipment.

While you are looking at the drop tests, I wish to say now what I think you are now all prepared at least to understand, that it is not the amount of carbon which so much concerns us, as it is the form or condition in which we have it in the finished rail.



DROP TESTS OF THE "D" BRAND OF HIGH CARBON RAILS.

The cut shows beside the upright tested butts two in the foreground, marked May 5 and 6, 1892, which illustrate the character of fracture of very tough rails under the drop.

The base and web of the rail fractures at first independently of the head, usually two short pieces of the base and web being detached, the head not always fracturing as shown in the cut when the drop falls between the guides.

The cusp can be seen at the central fracture on the under side of the head in each of the rails.

The butt marked May 10, 1892, was .60 in carbon and received four blows from the drop of 2,000 pounds, falling twenty feet ; 1st, one on the head ; 2d, one on the base ; then two on one side. Greatest elongation per inch on edge of base, 19 per cent.

## SECTIONS OF RAILS.

The primary object of a rail is to enable you to make a safe and smooth track over which the movement of trains can be made with safety, dispatch, and with as little expense as possible.

While safety is the first consideration, the constant reduction in freight rates for many years has led to the adoption of heavier cars and higher speed to reduce the cost of transportation. Sections of rails and their composition which was adequate for traffic many years since do not now fully meet the changed condition. Fifteen years ago the common freight carload was ten tons, and the weight of the car about the same, so the wheel loads for a light car were 2,500 pounds, and loaded 4,500 to 5,000 pounds. Locomotives carried from 10,000 to 12,000 pounds per driver, the freight trains being made up of twenty to twenty-five cars. To-day the common carload is thirty tons, the car weighing fourteen to fifteen tons, and the freight trains made up of forty to sixty cars. The wheel load of an empty car is 3,500 pounds, and loaded 11,250 pounds, the weights upon the locomotive drivers have increased until 16,000 pounds, 18,000 pounds, and 20,000 pounds are common for freight locomotives, while upon passenger locomotives the weights are 20,000 to 22,000 pounds per driver, the passenger coaches and sleeping cars weigh from 40,000 to 80,000 pounds, the wheel loads ranging from 5,000 to 7,000 pounds.

Our rails must not only distribute the weights of the loads upon the ties, but the surface metal in the head of the rail should be able to carry the wheel pressure per square inch of contact of the wheel without undue flow and abrasion. To-day we are obliged to deal with wheel pressures per square inch of contact from 80,000 pounds on the small wheels to 150,000 pounds upon the locomotive drivers, measured on rail heads of 2⅜ inches in width. It is not much wonder that rail heads flow, abrade, or that tires wear with great rapidity, for the wheel pressures far exceed the capacity of the metal to sustain on the narrow-headed rails.

### STIFFNESS OF THE RAILS.

You know, from practical experience with the 4-inch, 4¼, and 4½-inch rails, under present traffic, that they cut rapidly into the ties. The 4-inch rails would cut the fastest, as each tie would receive a larger percentage of the wheel load. The 4½-inch rails, being perhaps 30 per cent. stiffer, would distribute the load over more ties, and not cut so rapidly. It is not width of base alone which prevents the rails from cutting the ties, but stiffness of the rails to distribute the weight over two or three ties. There should be no movement between the rail and the tie. A 5-inch rail would be 40 to 60 per cent. stiffer, according to the section, than the 4½-inch, and would not only distribute the wheel loads over the ties, but lessen the deflections and the train resistance. So decided is the increase in stiffness in the 5-inch sections that in riding over the Boston & Albany railroad, it is apparent in a car the instant you run from the 95-pound rail to the 4½-inch, or vice versa. Stiff rails require much less labor to take care of the track than the lighter, weaker rails, and are less injurious to the ties. I am also anxious to have considerable distance from the neutral axis of the rail to the head and base, to reduce the strains in the metal, permitting the use of a grade which will better resist flow and abrasion. While we can easily provide stiffness in the rail, a metal which will carry the present wheel pressures, is far more difficult to secure.

### WIDTH OF BASE.

The old rule, "the base as wide as the height," does not apply to the broad-headed, stiff sections, with the same force as to the light, weak sections. A wide base increases the difficulties of rolling to a very marked extent, producing mechanical defects, which can be partially met only by a decided loss in the physical properties of the rails. In rolling a rail, the pitch diameter of the rolls passes through the center of the web, and the extreme edges of the flange are drawn through the rolls just as fast as the web. The flange slips instead of being rolled through. The metal is often torn in the flange, due to this effect, and when upon the exterior is readily seen and thrown out, but when the injuries are internal, that is to say, the effect of some gas bubble intensified, the metal being torn apart internally, instead of being closed up, those defects cannot be seen in the rails, and they will go out into the track. This has already occurred in the 5½-inch base rails ; 4¾-inch base and 5-inch base rails, rolled out of the same stock, have not shown a single internal similar defect. As the width of base increases, the probability of the internal defects near the junction of the base and web will be increased. The wide-based rails, being much longer in cooling, the metal builds up a coarse structure of not as high physical properties as would be the case in a finer structure. This last feature was well demonstrated in the 90-pound rail for the Metropolitan Underground Railway of London, which was rolled with a base 6⅜ inches wide, and only 4½ inches high. The head of the rail was very coarse structure and wore rapidly. It was also expected it would save the ties from cutting, but not being a stiff rail, but 16 per cent. stiffer than the Boston & Albany 4½-inch, 72-pound rail, the ties cut, and it was replaced with double-headed rails and chairs.

### WIDTH OF HEAD.

If you increase the width of the head, you increase the angle of stability just as rapidly for side pressures, as though you increased the base. That is a very important point to take into consideration ; if you increase the width of the head, you are increasing the angle of stability from the head to the base. You also have a greater width of metal to support your wheel pressures, prolonging the life of the tires as well as the rails. This has been well demonstrated on the N. Y. C. & H. R. R. R., the wear of tires running on the 65-pound rail, 13,000 lbs. per driver, was about 19,400 miles per 1-16 of an inch wear of tire. Now on the 80-pound rail, with 18,000 lbs. per driver, it is 19,300 miles per 1-16 inch wear of tire, but in mileage locomotives often run 140,000, 160,000, and one made 187,900 miles between the turning of the tires. An engine now rarely goes to the shop for the tires to be turned, except other general repairs are required. In the freight service still using the 65-pound rail, the wear of the tires often determines when the engine shall go to the shop.

### UPPER CORNER RADIUS FOR THE HEAD OF THE RAIL.

The upper corner radius on the original 80-pound rail is 5-16 of an inch, and on the New York Central a sharp driver flange, or a truck-wheel flange is rarely seen. In the tender wheels and those of the cars where the pedestals and journal boxes are not planed, some of the wheels not running normal to the rail, but at an angle, sharp flanges frequently occur, and would, no matter what the upper radius of the corner might be.

The heads of sections are all supported by large fillets, which is equivalent to a greater depth of head with a small fillet, so they will not break down when worn, or bend over on the curves. The curve of the web helps control the heat in rolling, and is very firm when in the track. The thin head gets a large amount of work from the rolls, cools rapidly, and by the composition we have been able to secure fine structure in the heads, and very tough rails.

President—Mr. Dudley, in our discussion this afternoon there was a question asked, and it was hardly decided. We thought perhaps you would be able to answer it and give us some information about it. It was in regard to the expansion and contraction of rails, whether the light or heavy section expanded or contracted the most.

Mr. Dudley—Well, I doubt whether there would be very much difference. You mean expansion in length ?

President—Yes, sir, in different changes of temperature.

Mr. Dudley—There would be very little difference. Of course with a lighter rail it would occur more rapidly, but after a long continued temperature there probably would be the same expansion. In one cold night perhaps you might notice a difference, that is for a few hours, because it would take a longer time to equalize the temperature with a large rail than it would with a small one. If it continues for some hours I don't think it would show very much difference.

Mr. French—Mr. President, I would like to ask Mr. Dudley what he considers to be the best rail section under the conditions of to-day ?

Mr. Dudley—Well, you can understand that to be the 80-pound section that I have spoken of, which has been carefully tested by me, the one that has just been adopted by the New York Central, 5⅛ inches high and 5 inches base. They have a large amount of that new 80-pound now in the track, about 60,000 tons. Mr. Otis in riding over the track last week said that he could tell the difference the instant he struck that, because it is about eleven per cent. stiffer than the old 80.

Mr. French—And what percentage of the metal is in the head of the new 80, and what percentage in the head of the old 80 he refers to ?

Mr. Dudley—The percentage in the old 80, as I remember now, is about 43 per cent., and in the new about 42.

Mr. French—Is the new 80 any broader ?

Mr. Dudley—Of just the same width.

Mr. Ellis—I have a question to ask. In the fillet under the head, you take two, one a quarter and the other a half, with any joint in use—and there have been a great many of them—the half inch that you have of course reduces the distance for a bearing, for a support. That is with the same width of head ?

Mr. Dudley—Yes.

Mr. Ellis—But, if I understand you right, you put in the half inch so that when the rail is worn down it will not crack off.

Mr. Dudley—I support the head, and get then the effect of the roll pressures in the rail, and I get a very much finer and better structure.

Mr. Ellis—Then another question. Take the Reading rail, the 90-pound, and still taking your same 80-pound, the thickness of the other would be more—is there profit in this thick member ?

Mr. Dudley—Of course I don't think it is necessary at all. It is entirely unnecessary there. If you will compare those two heads, you will see that that 90-pound has practically not as much bearing surface as the 80.

Mr. Ellis—No. They are about the same height. Taking and laying these two together, you have got more bearing for the wheel with your 80-pound than you have with the 90. And with the fillet on the corner, if the car wheels are in perfect condition there will not be very much wear.

Mr. Dudley—There is no wear with the locomotives. Of course the car wheels, many of them, run at an angle as they are constructed on the Philadelphia & Reading.

Mr. Ellis—Which would be obviated with centre bearing of the cars?

Mr. Dudley—Having the wheels made so that they will run closer to the rail and be perfectly parallel.

President—I would like to ask Mr. Dudley about what the limit is in rolling a rail, whether or not it is practicable to roll a broader base than the height of a rail?

Mr. Dudley—Oh, yes, that is done right here in this, you see (indicating a rail section). Of course you increase the difficulties right away not only of rolling the section, but also making internal difficulties, to say nothing of flaws or gas bubbles, or anything like that. The rail train would have to be made larger. That is the very point at the present time. It increases wonderfully the number of seconds in some classes of rail. Just after I finished rolling this (indicating a rail section), there was another section that was rolled with an angle of thirteen degrees. We rolled the other rails through with about two per cent. of seconds; but this increased the seconds at once, from the thickness of that flange, its angle being very much smaller, and they ran up to about five per cent. It is much more important to the railroad company to have a section that rolls through with a few seconds, than it is to the rolling mill people. Because with all the care that you possibly can give, looking at these sections and inspecting them in the mill, there will be a great many of those sections go out that ought not to go out. Nothing will show upon the surface, but they will be like this rail (indicating one of the rail sections), with all these little places that are exceedingly brittle and will crack. That is one thing we look out for in testing these butts. Sometimes we have a butt that will fly all to pieces. No rails are shipped until after these butts are tested and it is seen that they will stand. Then they will have a piece cut from the rail, and see whether that will stand the test or not. But usually we find something in the butt. It is much more difficult to make large rails than the small sections. The difficulties increase very rapidly, and the mills have to learn to do that. They cannot make these large rails as well at first as they can after a little experience. It would seem at first that it would be no more difficult for them to make a heavy section than a light one, but a great many things would have to be considered, and that we have to find out by experience.

Mr. French—The popular impression and opinion is that we should have the base of the rail as wide as possible to prevent cutting into the ties. Now the new designs in your paper to-night are calculated to influence our ideas, so that we would wish to have a rail higher than its width of base.

Mr. Dudley—It is stiffer.

Mr. French—You say it would prevent the cutting down into the tie by having the rail stiffer.

Mr. Dudley—Yes.

Mr. French—Now what is the ratio or comparison between a rail of wide base and a higher, stiffer rail, both designed to prevent cutting into the ties ?

Mr. Dudley—I will cite as an example the Metropolitan Railroad of London. It is now many years since I ran over the calculations in regard to that rail, but when I was making the New York Central of 80 pounds, I found that that 90-pound rail, which is $6\frac{3}{8}$ inches base, lacked 28 per cent. of being as stiff as the 80-pound that I tested for the New York Central. That is the point. I probably have not made that perfectly plain to you. I will take this little stick, for instance. I put a weight upon this side, and you see it bends down very rapidly. If I turn it up this way (turning it up on its edge), it will hold that weight up. The leverage is longer, and in the case of a rail it makes it stiffer, because it carries the weight over more ties. Here is a representation of it (producing a diagram). That is an actual experiment with a train on a bridge, and it shows you those deflections. Of course that is exaggerated, but that shows you that under every wheel where the base is under tension it has that wave motion. If we can make our rails so stiff that we can carry and distribute that weight over more ties, we shall prevent cutting. If you can hold your rail right tight to the tie, of course that would prevent cutting to a very great extent, because this motion that cuts down is very destructive. I have taken some instantaneous photographs of fast trains in motion, and you will see that all those deflections of the rails that are there shown are on light rails. You will see that there is quite a decided bend between the trucks of the car (produces photographs). With the 80-pound rail we have not been able to see it under those trains so very decided. It is a very difficult thing to do, there is a great deal of haziness and dust. We will try some further experiments, and possibly we will be able to see that motion. I want to say one word in regard to the 80-pound under the New York Central. Running that Empire State Express shows that it is a remarkably stiff rail. They are running that train —and have been for two years—at an average speed of fifty-three miles an hour between New York and Buffalo, and from sixty to seventy miles an hour for part of the distance. On a light rail it would be impossible for the locomotive to make that time. The advantage they see in this new model rail is that it is eleven per cent. stiffer than the old. That shows at once in the movement of the trains. In the consideration of any of those matters we cannot neglect the base, or anything of that kind, but we must give it proper consideration.

Mr. French—In the classification of rails we know what we use our seconds for, but what purpose do you think seconds are fit for ?

Mr. Dudley—That would depend upon the class of the second.

Mr. French—Then saying a rail is a second does not state just what it is.

Mr. Dudley—No, it does not ; because if there is a defect in the butts, unless that is the top rail I should have no objection to that going for the use of a frog, but if it is the top rail from an ingot, I should object to its being put in a frog; because it has a larger percentage of phosphorus in it, cannot avoid it, and I do not think it is advisable now, with these fast trains, to put that top rail into a frog.

President—Gentlemen, Mr. Dudley has but a short time longer to stay with us. If you have any questions to ask now I wish you would do so, because he has got to go to New York to-night.

Mr. Sibley—As I understand it, in the same ingot the top and bottom parts would be different.

Mr. Dudley—Slightly different, yes. That is the reason why I specify in these high carbon rails to have the phosphorus very low, so that it will not be in excess in the top rail. Of course we could stand a great deal more phosphorus, perhaps .08. I have made a great many rails that were up to .10 in the phosphorus, but I don't want those rails to go out; probably in the top rails it was up to .15.

Mr. French—I would like to inquire what your opinion is regarding the joint of these heavy rails, whether it should be a short or a long one.

Mr. Dudley--Well, for heavy traffic I think it should be long, for this reason: there will be less deflection of the rails if we make a pretty long splice, and the weak point is carried further back and supported.

Mr. French—I suppose there is such a thing as getting it too long?

Mr. Dudley—Oh, yes, you can do that.

Mr. French—About how long?

Mr. Dudley—The New York Central are getting excellent results from a 3-foot splice, and the Reading uses 20 inches, but that has a tie under the joint.

Mr. French—What is your opinion regarding that—should it be a suspended joint?

Mr. Dudley, No, I think that for heavy traffic you should have a tie under the joint. Of course for a single track and lighter traffic you will have very good results from the suspended joint, but they don't want to be very far apart.

Mr. French—And a 6-bolt or a 4-bolt ?

Mr. Dudley—I think a 6-bolt for those larger rails is better than a 4-bolt.

President—Would you advocate a 36-inch splice for a supported joint ?

Mr. Dudley—Well, I am advocating that.

President—Would you advocate the same thing for a suspended joint ?

Mr. Dudley—No, it would not be necessary to have it so long.

President—Do you think with a rail which has a narrower base than height there would be any trouble with its rolling, or canting, or working over ?

Mr. Dudley—I don't think so. There is another point that you should take into consideration. If you have a broad head the instant your rail begins to cant or move under the drivers, you can hold it down more easily. We tried that the other day. The instant you have a broad head it becomes more difficult to turn it over, you strike the flange of the locomotive and it holds it down. You will find that these broad rails move sideways, but don't seem to turn over as much as the narrower.

President—Have the gentlemen any further questions to ask Mr. Dudley ? Are there any remarks to be made on the subject before us ?

Mr. French—Mr. President, Mr. Dudley has come here very kindly, and gratuitously as well, although we did not expect him to do that, and I think it is the sense of this Convention that we should extend to him a vote of thanks for giving us the benefit of his study and experience on this question of so much interest to all of us here. I move that we extend to Mr. Dudley a vote of our most appreciative thanks for his kindness in coming here to-night.

The motion was duly seconded and carried unanimously.

President—Mr. Secretary, is there any further business to come up at this session?

Mr. French — Mr. President, nothing further, except that as to the exhibits in the two rooms adjacent to this; we should give them careful attention during the rest of this evening. We also do not want to forget that we are to meet at 8.30 to-morrow morning down at the Boston & Maine Eastern Division station, to take advantage of the trip out to see this complicated track work in connection with the Boston terminal. It is something that you cannot see anywhere else probably in the country, and I hope you won't fail to be present, all of you, at that time. Then we will get back here as soon as possible, and take up the interesting question of comparing the merits of the spring rail frog, when made properly and thoroughly, and the stiff rail frog. We wish to have a good thorough discussion of that question, as there are so many different ideas regarding it.

President—Gentlemen, if there is no further business to come before this meeting, we will adjourn to meet at the Boston & Maine Eastern depot at 8.30 to-morrow morning to go out and see the work on the Boston terminal, and afterwards meet here at 9.30 to take up and finish our business. I hope the members will go into the rear rooms and look over the different devices.

## SECOND DAY—MORNING SESSION.

The Convention re-assembled at the American House at half past nine o'clock, the President in the chair.

President—Gentlemen, the time has arrived when we should come to order. I have before me an application for membership from Mr. De More, Assistant Roadmaster on the New York, New Haven & Hartford Railroad. What is it your pleasure to do with this application?

On motion of Mr. Stevens, duly seconded, Mr. De More was elected a member of the Association.

### COMPARATIVE MERITS OF SPRING RAIL AND STIFF RAIL FROGS.

President—Mr. Secretary, is there any business to come before this meeting previous to taking up the second question for discussion?

Mr. French—Mr. President, I don't know of any.

President—The question which now properly comes up for discussion at this time, is the second question on our list: Comparative merits of spring rail and stiff rail frogs when each kind is properly and thoroughly made. Will the Secretary please read the report of the committee on that question?

Mr. French—Mr. Collins is here, and as he is chairman of the committee, perhaps he will read it.

Mr. Collins—Mr. President and members of the New England Roadmasters' Association:—Your committee who have been asked to submit a report on "Comparative merits of the spring rail and stiff rail frogs, when each is properly and thoroughly made," present as to points of merit in favor of the spring rail frog: 1. Durability. 2. Smoothness of riding of trains on acconnt of its continuous rail. 3. Remaining to better surface. In favor of stiff rail: 1. In case of broken wing rail it being more safely secured. 2. Better resistance to the action of double flange of worn wheel tires, especially those of the driving wheels.

We also present the following questions pertinent to the main question: 1. Which is the cheaper to maintain during the winter? 2. Relative expense of mechanical repairs. 3. Relative liability of snow and ice causing trouble. 4. Relative life of frog timbers. 5. Relative cost of repairs to rolling stock, whether spring or stiff rail frog are used. 6. Which should be the difference in per cent. of traffic of the two tracks to warrant using of the spring rail? 7. Is it advisable to use the spring rail at a junction of a branch with main line tracks, where both are used for passenger tracks, but where there are many express trains on the main line? 8. Which should be used when the frog is on the inside of a curve for main line? 9. Where is the most advantage in the use of the spring rail for main line in a trailing or facing point connection? 10. All points of merit considered, what is the relative factor of safety?

All of the above is respectfully submitted.

R. P. Collins,
J. M. Torr, } *Committee.*
J. W. Drew,

President—Gentlemen, you hear the report of your committee on the merits and demerits of spring rail and stiff rail frogs. This is a question which I am much interested in. I never have had the use of spring rail frogs, and I am anxious to hear from the roadmasters who have used them the results which they have had. The question is now open for discussion, and I hope every member will take part in it, and get through with the business as rapidly as possible, on account of the short time that we have.

Mr. Drew—Mr. President, I notice that we have but sixteen or eighteen roadmasters here. Isn't there any way in which some of the absentees can be gathered in?

Mr. French—Mr. President, I move that the chair appoint Mr. Drew a committee to go and see if he cannot hunt up those roadmasters, and have them come in to stay.

The motion was duly seconded and carried.

Mr. Drew—I might want some help.

Mr. Collins—I hope brother Drew will be careful of his grip, or he may not be able to keep them after he gets them here.

President—I would like to hear from Mr. Collins his experience with rail frogs on his division.

Mr. Collins—Being one of the committee I should prefer to hear some of the other members tear the report to pieces first, and then we will take up the defense.

President—Then I will call on Mr. Sargent, of the Northern Division of the New York, New Haven & Hartford road.

Mr. Sargent—Mr. President, in regard to the use of stiff and spring rail frogs, for a junction where trains run at a rapid rate, using both tracks as a main track, I should not be in favor of using the spring rail frog. I have great faith in them for use in sidings where they are used occasionally. I think they ride easier, and it is more like an endless rail, very little jar and noise; but using spring sides for fast running, using them as a common thing, I should not approve of for my part. We have used them for a good while and have liked them.

Mr. Stevens—Mr. President, I am opposed to the spring rail frog. I don't like them, although there are some places where you can put them where they will do good service. A few years ago we gave up the old cast iron frog, and fitted our road with spring rail frogs, and we had a great deal of trouble with them. They broke, they spread out with snow, and we abandoned them, and have now the stiff rail frog throughout our road. I know there are a good many roadmasters who talk long and loud about the spring rail frogs; but there are a good many places and a good many junctions where you run along as fast as you do on the main line nearly; those rails have got to spring pretty lively, and there is where it makes most of your trouble. I don't know as I can do anything more than refer to the trouble that we had, and say that we abandoned them, I think there is some division of our road which is using the spring rail frog, in fact I know there is, I think the Central Massachusetts Division. But on my division I hav'n't a spring rail frog. I don't put very great faith in them ; others of you may, but for my part I don't like them.

President---I would like to ask Mr. Stevens where the trouble seems to be, where they give out first, what requires the most attention.

Mr. Stevens—Where they give out in the beginning is near the point, of course. But you get breakages anywhere in your rail. We have had lots of breaks. It might be the quality of the steel possibly, but we have had a great deal of trouble, and we threw them all away on the Eastern Division.

President—Would the spring rail give out at the point as quick as the stiff frog ?

Mr. Stevens—No, I don't think it will. At the point is where all stiff rail frogs give out. That is where our trouble begins, there. But they generally last until the frog is worn out, and it wants to be thrown away, according to the service a frog has given, anywhere from two to eight or ten years.

Mr. Jackman—I would like to ask Mr. Stevens what make and what weight of rail those frogs were that he refers to ?

Mr. Stevens—Sixty-pound rail.

Mr. Jackman—How long ago were those frogs in ?

Mr. Stevens—How long ago did we use them ?

Mr. Jackman—Yes.

Mr. Stevens—Well, I guess thirteen years ago, or more than that, fifteen years ago we began to throw them away.

President—I would like have all members that have had any experience with spring rail frogs relate it. It is something that some of us have had nothing to do with, and I for one would like to hear it. It is something that is advocated by some of our officials. I would like to hear from Mr. Bishop, of the Fitchburg road.

Mr. Bishop—Mr. President, I have just arrived, but I should judge from the discussion that the subject was frogs.

President—Spring rail frogs in comparison with stiff rail.

Mr. Bishop—Well, I have had different opinions of the spring rail frogs. There are some styles of spring rail frogs that I would not use in the main track, and there are some that I should feel perfectly safe to use. I should recommend a stiff rail frog at junctions, and in yards where there is continual switching, and at some outer switches I should still recommend the spring rail frog, with some device to hold the wing down level with the stock rail. Four or five years ago I had several derailments trailing through a spring rail frog, a pattern that did not have any device to keep the wing rail down to the stock rail. We have a spring rail frog now, made by the Ramapo Company, with a device which keeps the rail down, and we have not had any trouble with that, but with the one that we formerly had, that had no such attachment, I had four or five derailments in one winter, caused by snow and ice collecting under the wing, and raising the wing up perhaps a quarter of an inch, and the driving-wheel, or some other wheel throwing the wing out. I know that in some places on our main tracks we wear out a stiff rail frog in one year, and in the same track a short distance from that a spring rail frog has been in the track six or seven years, and is in good condition now. I don't think there is any question as to economy, but there is a question, in my opinion, about safety.

Mr. Drew—Mr. President, I have used spring rail frogs for the last ten or a dozen years, more or less, and I never had any trouble about derailing, or anything of the kind, and had no expense. I have them on the outside of 3-degree curves where we run express trains, and never heard any complaints. I have never heard a section foreman say the frog is worn out, which is frequently the case with a stiff frog. If the track is in proper surface I can't see where there would ever be any trouble with the wing part of the spring frog. The first I used, those that were first made, there was no guard to, but I never knew any trouble about the rail going out in any way. As far as repairing is concerned, I never did any, never took one out unless we changed tracks, or re-modeled them, or something of that kind. They never give us any trouble. At stations where express trains pass, of course it is the same as a whole rail. I never had a spring rail frog wear out, never had to take one out on account of its being worn out. There is no thumping ; that is always the case with a stiff frog, and there is no way to avoid it. A stiff frog will wear out in three or four years in places where there is much traffic, while a spring frog will go from six to eight or ten years in that same place. I am a great friend of spring rail frogs. They never give any trouble, and are no expense. That is my experience for the last dozen years.

Mr. Bishop—I would like to ask Mr. Drew if he has trouble with ice and snow on his division very much ?

Mr. Drew—Well, not as much as they have in Vermont, or in New Hampshire, or Canada, of course, although some winters, like last winter, we have plenty of snow, and are blocked up as much as any road in the country. We have put braces on most of our spring frogs, so that when it is out it will be about the same as a stiff frog. If the wing don't come clear back, it don't give any great trouble, the trains go through it all right, and I never knew one to give out. We have probably not as much snow and ice in the country where I am as where you hold forth.

Mr. Stevens—I think, Mr. President, they must make the frogs out of better steel than we had if they don't wear out at all. Of course you must think they are the cheapest and best frogs.

President—I would like to hear from Mr. Bryant of the New York, New Haven & Hartford road, Old Colony Division. He has had some experience with those frogs.

Mr. Bryant—Gentlemen, I have had some experience with spring rail frogs, and have had some of them work on rails of fifty-six pounds, 4-inch steel rail. I have had some derailments, too, and I didn't feel as though they were safe to use on a light rail. I have also had some experience with spring rail frogs on 4½ inch 74-pound rail, and those gave me very good satisfaction. I have not had very many of them break; I think I have had one, but it caused no trouble. I find that the spring rail frog is a very cheap frog to use, and gives me very little trouble. There are some makes, that Mr. Bishop speaks of, where the wing rail does work up where there is constant snow and ice, and I agree with him that they should be fastened down. I think we have a frog now that fills the bill. I have already ordered quite a number of spring rail frogs to use in our track from South Braintree to Boston, on 87-pound rail, which I do not feel afraid of and think perfectly safe, or I should not put them in. I intend to equip that part of the road with those frogs, both for safety, durability, convenience and economy.

Mr. Drew—Mr. President, Mr. Bryant has given the spring rail frog considerable credit, yet he got out a stiff frog, which I have used, a very good frog indeed. Perhaps we would have to discount a little on his partiality for a stiff frog, I don't know.

Mr. Bryant—No, sir, not at all, because you see already I have gone in for the spring rail frog. I think, however, I can build as good a stiff frog as there is.

Mr. Drew—I would say further, Mr. President, that if I were put right to the wall, and it was life and death, as far as safety is concerned, which should be dead sure, I suppose I should take the chances on a stiff frog rather than a spring frog, although I never had any trouble with the latter. There is more possibility, more chance of an accident with the spring frog, probably, than with the stiff frog.

Mr. French—Mr. President, I would like to ask Mr. Drew where that possible chance is with the latest improved and most thoroughly made spring rail frog? We are not talking about what was used six years ago, but the latest and best spring rail frog that we ever saw. Where is that possible chance ? Where does that chance of danger lie ?

Mr. Drew—Mr. President, I have neither used nor seen those recent frogs, and therefore cannot answer that question. Possibly I should decide at once, if I saw those latest frogs, that there was no more chance of an accident with those than there was with the stiff frog.

Mr. French—Mr. President, I think that all those who used the spring rail frog of certain patterns five or six years ago found this difficulty, that in winter the snow and ice will raise the wing rail above the stock rail, so that occasionally we would have an accident trailing through. That frog has no device for keeping the wing rail down on a level with the point, and it has no device to keep the wing rail from going out way beyond where it should go. On this latest frog we have a device that holds that wing rail right down on a level with the rest of the frog, and we have a device that keeps that wing rail from going out beyond a certain distance, this distance giving the same space that our stiff rail frogs have. Therefore, what is the element of danger ? I might say that with spring rail frogs not having these latest devices I never found but little trouble, and I have had charge of about one hundred miles of road equipped with them for about four years, though I should not now use anything but the latest and most improved spring rail frogs, and these I do consider perfectly safe and four times as durable as stiff rail frogs.

Mr. Clark—Mr. President, Mr. Drew speaks about there being a possibility of an accident. I think that a spring rail frog, properly protected, and properly put in and guarded, is the strongest point in the track, the way they are put in nowadays. I will illustrate my method of putting them in by this drawing here (producing a drawing). In addition to the usual safeguards for spring rail frog, I put a guard rail brace here, so that it cannot possibly open but an inch and three-quarters at this point, the end of the spring rail. Also another one here, so that if you break that rail off there, they will go through with perfect safety.

I have a long guard rail on the opposite side that guards the whole length of the frog, the whole fifteen feet. I think it is better secured than any other portion of your track. You have from this point, the point of the frog, to this spring, that is not spiked, it is spiked all the rest of the way. That is the way I put them in, and I never have seen any trouble. We have to-day in the track a frog that I put in sixteen years ago. There is no patent on it. Mr. Parsons probably made it. It has a plate six feet long, I think a 4-inch rail. That frog is in as good shape to-day as the adjacent rails. I can show it to anybody.

Mr. Stevens—How many trains do you run over it a day ?

Mr. Clark—About twenty trains a day.

Mr. French—That is the Pennsylvania frog ?

Mr. Clark—That was one that they made ten years ago.

Mr. French—That has not got the latest improvements ?

Mr. Clark--Not the latest improvements.

Mr. French—And you call that safe, and have found it safe for seventeen years.

Mr. Clark—Yes, but the plate spring rail frog is very much superior, of course, for they have had sixteen years to improve it. I would not have anything else but a spring rail frog, if I had my way.

Mr. Collins—Mr. President, Mr. French brought up one point which I was about to do. Our question is, when thoroughly and properly made ; that is the comparison we are making of the two frogs. I think brother Stevens's experience has been with some that were not thoroughly and properly made.

Mr. Stevens—Not made exactly as it is to-day ; but they were properly made, and thoroughly made, in our own shop, most of them, of good steel.

Mr. Collins—There has been a great improvement made by the different companies in the construction of the spring rail frog, so much so that some roads that had abandoned the use of a spring rail frog are now taking it up again on this improved basis. I have had an experience with the spring rail frog of from nine to ten years, and my experience is very much in favor of the spring rail frog for the main line. Of course I should not advocate its use where one track was used as much as the other. My way of securing those those spring rails is very similar to Mr. Clark's, using braces—and as Mr. Drew also expressed—to prevent the rail from going out any further than it ought. But with that frog that has lately been presented to us a good deal of that is not needed, I think it is taken care of by their devices.

Mr. Clark—In regard to those other devices that he speaks of, the latest plate frogs that we have—that is the frog (indicating a page in last year's pamphlet)—the plate extends back further here. I drill right through that plate and put a brace on it at that point, making it doubly secure. This piece that runs under the rail here, and which is movable, of course, has a clamp on it or a clip, that holds it down in proper shape; and this frog (referring to a drawing) on the spring rail side has braces, and when it is open an inch and three-quarters it is in the same condition as any stiff frog, and I think just as safe. With the new style of frogs there is a plate along here that prevents any damage if they break at that point. The old frogs did not have that plate or were not protected at that point.

Mr. Sargent—Had no reinforcement at all?

Mr. Clark—No reinforcement.

Mr. Sargent—All new styles of frogs, as I understand, have, or a good many of them?

Mr. Clark—Yes. I think sixteen years pretty good service for frogs.

Mr. Stevens—That is one particular frog—how about the others after sixteen years?

Mr. Clark—There have been some changes made on account of altering the location of frogs. This one has not been moved. I have other frogs that have been in the track just as long, but not in one place.

Mr. Bishop—Mr. President, they talk about using the spring rail frog because it is safer –I don't take any stock in that at all. I consider a rail spiked to good sound ties the safest track we run over. Whenever you make a break for a frog or switch, there is a possibility of an accident sometime, although it may never occur ; but you break that solid continuous track. I don't believe that a frog which when you put it in you have to put braces on and all the attachments and patents you can think of, is a properly constructed frog. I think if we adopt any spring rail frog or recommend it, it should be one that comes from the factory ready and safe to put in a track without any further attachments to it whatever.

Mr. Clark—You might say that of a rail, and we all use braces. And why I say it is safer than any other portion of the track is because it receives more care and attention, is looked after more closely.

Mr. Bishop—And consequently it would be more expensive.

Mr. Clark—Than the other portion of the track, yes.

Mr. French—Mr. President, with the spring rail frog we used previously we thought it was necessary, and we found it to be necessary, to put on these different safeguard attachments, but now we have a frog that comes from the factory, so that we can put it into the track just as we do the stiff rail frog, and after we have got that frog in we don't have to put these additional safeguards on it. That is the frog we are talking about, a frog that is made so that we don't have to put on any additional safeguards. Now of course we do not recommend using that frog at junction points or in large yards. In such places we ought to use the stiff rail frog, because trains use one side of the frog just as much as they do the other side of the frog. We will bar that point right out in our discussion. We are talking about using a spring rail frog in our main line, where perhaps once out of a large number of times they use the side track, and then at a slow speed. We are talking about having these spring rail frogs out at stations where trains do not stop; for those places these latest frogs cannot be found fault with, and they will last four or five or six times as long as rigid frog. Why isn't it economy for railroad companies to use that spring rail frog in those places?

President—I would like to have all the members who have had any experience with these frogs give us the benefit of it as soon as possible. I would call on Mr. Patch, of the New York, New Haven & Hartford road, if he is in the room.

Mr. Patch—I didn't exactly understand what you said. I thought you said some gentleman from the New York, New Haven & Hartford road. I don't have the honor of working for that company.

President—I hope I may be excused—the Boston & Maine instead of the New York, New Haven & Hartford.

Mr. Patch—Mr. President and gentlemen, all of you who have heard me talk on frogs, know just where I stand. I go in for a spring rail frog in the main track every time. No doubt I have had as much experience on that point as any gentleman in the room. We commenced to use the spring rail frog in 1872, and we have used them from that day on. I never had any occasion to change my mind on the merits of the spring rail frog and the stiff rail frog. I can say one thing, that in the whole twenty-one years I never have had a wheel off the rail on account of a spring rail frog. We commenced to use, in the first place, the Pennsylvania spring rail frog. We called that a good frog at that time, but there have been great improvements made in frogs from that time up. I have a Pennsylvania steel spring rail frog in the track to-day that was put in in 1875, and it is a good frog to-day. I shall not take it out for a number of years yet unless we change from a 56-pound to a 70-pound rail in that place. There is a little more expense in taking care of a spring rail frog in the winter time than there is in taking care of a rigid frog. You have to go round and sweep the snow off oftener in order to make the spring rail work as easy as it ought to;

but at the same time I don't think there would be any damage done if we did not sweep them off, I think the rail would move out and in again of itself. The spring rail frogs that are made to-day are so arranged that there is an arm that holds the wing rail down to its place, not giving it a chance to get much snow or ice under that rail. We make a practice in the winter time, when it is snowing, to salt our frogs once a day, which will keep the snow and ice from accumulating, and it will take care of itself. There is no doubt in my mind at all but what for economy a spring rail frog is more than three hundred per cent. in advance of a stiff rail frog. And I consider it just as safe as a stiff rail frog. There is no frog ever put in a track but what there is a liability of having something happen, but I don't think the liability is any greater with a spring rail frog than with a stiff rail frog. I would not advise them at a junction where there are three or four times the number of trains run on the main line that there is on the branch track ; but for a main line outside of a junction, I think that there should be no other frog used but the spring rail frog.

Mr. French—Mr. President, I would like to ask Mr. Patch how long a stiff rail frog would have lasted where he has had that spring rail frog in since 1875.

Mr. Patch—I could not answer that question, because I never had a stiff rail frog in. When we changed from the old iron we had a cast iron frog in there. When we changed from a 3½ inch iron to a 4-inch steel rail was the time that a spring rail frog was put in. Take it where there is about the same amount of traffic, I think you will probably find that a spring rail frog will outwear four stiff rail frogs.

Mr. French—You think that is the proper ratio for comparing the two frogs as to their durability, four to one ?

Mr. Patch—Yes.

President—I would like to ask Mr. Hamilton, of the New York, New Haven & Hartford road, who is doing a lot of new work and putting in new rail, what kind of frogs he is using ?

Mr. Hamilton—Mr. President, we are using on the main line 100-pound rail, the spring frog entirely. In the yards we are going to use stiff rail frogs. On the main line where the work on the siding is comparatively light, we will use a spring rail frog entirely.

Mr. Patch—Mr. President, I would like to say one word more. We took out this last summer, some 56-pound spring rail frogs that had been in the track since 1874, and I am going to take those spring rail frogs up onto our Ashuelot branch, put them into the main track there, and let them run for eight or ten years longer. I think they are good for eight or ten years of service on that branch.

Mr. Drew—Mr. President, brother Bishop's line is amongst the mountains of Vermont and New Hampshire, or the western part of the state, and brother Patch's is in the Connecticut valley, where there is not a great deal of snow trouble. I have been on the Cape, where we have more sand than snow, and notwithstanding I never have any trouble with those frogs, yet brother Bishop might, in the locality where he is placed.

Mr. Patch—Mr. President, I would like to say that I think we have fully as much snow in the Connecticut valley as Mr. Bishop has on any part of his road. We don't think anything of having four or five feet.

Mr. Clark—In addition to what Mr. Patch says, I will explain the nature of the snow that he has. He has snow that is filled with water, and becomes perfectly compacted ice, while that we get in my territory is dry snow that brushes away very easily. I think that the frogs have a harder time with snow and ice there than they do when you get further north.

President—This discussion seems to be drifting all in favor of the spring rail frog. I would like to hear from some members who can speak in favor of the rigid frog.

Mr. Patch—Mr. President, I don't see how any roadmaster can say very much in favor of the stiff rail frog when we are satisfied that a spring rail frog is equally safe as a rigid frog, and will wear out four rigid frogs—one spring rail will wear out four. I don't see who can say much for a rigid frog or a stiff rail frog in the main track.

Mr. Stevens—Mr. President, Mr. Patch has had remarkably good luck with his spring rail frogs, better than any man I ever heard talk, and I have had very poor luck, and don't believe in the spring rail frog. Give me a good stiff frog. It seems the Boston & Albany people have not adopted the spring rail frog. Now if they are so good, and so nice, and so safe, it is very funny that the Boston & Albany folks have not got some. Our old General Manager Furber would not have a spring rail frog in the road if anybody would give them to him, but then he is an exception, of course. There is no question in my mind but what the stiff frog is safer than a spring rail frog. I hope I shall not be called upon to use the latter while I railroad, which will not be a great while longer probably. I believe in a good stiff rail frog.

Mr. Patch—Mr. President, brother Stevens brings up this question : If a spring rail frog is a good frog what is the reason that the Boston & Albany do not adopt that frog ? I will say that the Connecticut River road adopted the split switch, and used it for more than ten years before you could get the Boston & Albany to put a split switch into their track ; they used the Wharton switch. To-day they throw out the Wharton switches, and put in nothing but split switches. They will come to the spring rail frog in a little while.

Mr. Clark--Mr. President, I will also say one thing in regard to the Boston & Albany, and one or two other roads that are considered first-class roads. They kept the old cast iron frogs in the main track until within the last six years, some of them. So I don't think they are to be looked upon as an example in that line. The Great Western of Canada, had the best track in the world with that exception. I don't know whether they have got to using rail frogs yet or not, I think likely they have. There was no better road on the American continent at one time than the Great Western, with that exception. They clung to the old stub switch and the old cast iron frog. They had good ballast, good steel, and everything that was requisite to make a good road. So I don't think we should look upon such roads as examples.

Mr. Stevens—I should like to ask Mr. Clark if he has any cast iron frogs on his road ?

Mr. Clark—Not a cast iron frog.

Mr. Stevens—I have got lots of them ; they are not all taken out.

Mr. Patch—I want to correct a statement that I made about the Boston & Albany using the Wharton switch. I should have said it was the Tyler switch that they used to use, not the Wharton.

Mr. Drew—Mr. President, I don't think it is anything against the spring rail frog that the Boston & Albany, or any other road do not use it. The Concord road of New Hampshire, one of the best roads there is in the United States, used the old switch and cast iron frog up to within the last seven years. I don't know of a better road in the United States than the Concord road. I was on that road forty-nine years ago. I have known of the Boston & Albany having an old eight by ten timber across the side tracks for a de-rail, and they did not have any de-rail, while our folks did have them in use. I don't think it is anything against the spring rail that the Boston & Albany, or the Concord road has not adopted it. I presume the Concord road does have it now, but ten years ago the Concord road had the old stub switch and the cast iron frog.

President—We have a new member with us, Mr. De More, of the New York, New Haven & Hartford road, and we would like to have him relate his experience with the spring rail frog ; I understand it has been quite extensive.

Mr. De More—Mr. President, I am a little bit new in this position, and I would like to hear from some of the older gentlemen.

President—We have canvassed the room pretty thoroughly. We simply want to get at the ideas of the different members, in order to come to some understanding.

Mr. De More—Mr. President, the spring rail frog I have seen in use now for about ten or twelve years. We use them altogether in our main line, and I cannot see but what they are all right. We never had any trouble with them. According to my notion, I think they are the only frog for the main line.

Mr. Hamilton—I would like to ask Mr. De More what he thinks of the comparative wear of the spring rail and the stiff rail frogs that he has on our 74-pound rail ?

President—Will Mr. De More answer that question ?

Mr. De More—I hardly understand what Mr. Hamilton means.

President—The comparative wear or durability of spring rail and stiff rail frogs.

Mr. De More—Well, in our yard at New York we have had stiff frogs there that would last us about a year or eighteen months, and we have a spring rail frog in the same track which has been there three years, and is in good shape now. A stiff rail frog wears out in about a year or eighteen months with 74-pound rail.

President—Has any roadmaster anything further to say on this question ?

Mr. Drew—Mr. President, I don't see as we have got much opposition to spring rail frogs. Brother Bishop and brother Stevens don't seem to be fully converted, but I don't think it would take a great while to convert them. It seems to be about all one way, that there is no doubt about a spring rail frog being the cheapest and most durable frog used on the main line of a railroad.

Mr. French—Mr. President, as we have got two questions after the present question, besides other business, and only about a couple of hours in which to transact it all, I think we should expedite matters a little, and therefore I make a motion that the President appoint a committee of three to act upon the report of the committee that has been submitted to us, and bring in a resolution stating what the sense of this Convention is in regard to the merits of the two frogs.

The motion was seconded by Mr. Hamilton and carried, and Messrs. Bryant, Hamilton and Bishop appointed as the committee.

Mr. Bryant—I beg to be excused from acting on that committee. I don't feel well enough to serve, if you will excuse me.

Mr. Bishop—With all due courtesy I shall decline to serve. Mr. Drew says they have it all their own way, and I propose to let them have it their own way. I agree with Mr. Clark on one point; I would recommend the spring rail frog in some places where the gentlemen recommend it; but when you come to the point of safety you cannot make me believe that fifteen feet of loose rail is as safe as fifteen feet of rail spiked to the ties securely,

Mr. French—Mr. President, we don't want to have it all one way, and I was glad to have you put upon that committee, men who have different views. If we had had on that committee three men who would not take into consideration the merits of the stiff rail frog, it would look a little one-sided. On the committee you have appointed are men who are not radical either way. I think it is a good conservative committee, and I believe it is a committee which would recommend what they think is best. If we had three men who thought the spring rail frog was far superior and no doubt concerning it, they would not put in any conditions as to where the spring rail frog should be used, when perhaps it should not be used everywhere. The committee may perhaps think it is the best frog, but that under certain conditions it should be replaced by the stiff rail frog. I hope the members of that committee will serve. There can't be much work in it. We know that Mr. Bryant has had a hard time of it the last twenty-four hours, but there won't be a great deal of work in it, and we have not been in the habit of having any resignations at all; every one has been accustomed to take upon his shoulders whatever work was put upon them. I hope that just to help things along these members will consent to serve.

Mr. Clark—Mr. President, here is something that has been dwelt upon a great deal by some members in speaking of a stiff rail frog—

President—This discussion I understand is out of order, and a committee has been appointed to present a set of resolutions.

Mr. Clark—I am not going to discuss it, but I thought I would like to correct an erroneous impression that prevails about a 15-foot loose rail.

President—If there are no objections you may.

Mr. Clark—The frog itself is only 15 feet long, and 7½ feet certainly is stationary. A portion of the wing rail is spiked solid, so there cannot be any 15 feet of loose rail there. There is not over three feet—well, three feet I will say, possibly a little more than three feet, from the point of the frog to the spring. What is the distance, Mr. Parsons, from the spring ?

Mr. Parsons—Three feet.

Mr. Clark—That is the only loose portion of that rail as it is put in the track at the present time, I think. There is not fifteen feet of loose rail ; the spring rail itself is not fifteen feet long.

Mr. Bishop—Mr. President, if you will allow me I will concede about four or five feet, to save argument.

Mr. Clark—To the point of the frog it is seven and one-half feet, and there is only about four or five feet of rail there that is not spiked to the ties.

Mr. French—Mr. President, I will withdraw my motion if the gentleman who seconded it consents. If the committee does not want to take it into their hands to say what we shall pass as the sense of the Convention, let us get the majority opinion of the members present, by putting the question in this way : With a spring rail frog properly and most thoroughly made—comparing that with the best stiff rail frog, and taking into consideration that the spring rail frog is to be used only on the main line, outside of yards and junction points where the side tracks are used almost as much as the main track, how many of the roadmasters are there in the room who think that the spring rail frog is the most economical frog to use, and how many roadmasters are there in the room who will say that the stiff rail frog should be used all through the main track.

President--I would like to have the Secretary write out that motion, and we will put it before the Convention, and take a vote in that way.

Mr. Paxson—Is the weight of rail to be taken into consideration, light or heavy weight ?

President—I should think everything pertinent to the track as it is now, what is in use now or coming into use.

Mr. Paxson—Many of us have considerable 56 and 60-pound rail, and I have never seen a spring rail frog that I would consider entirely safe for a rail of that weight, as they are now laid. Taking a heavy rail section into consideration, I see no element of danger in it where they are reinforced, but with a lighter weight of rail I do not consider them entirely safe, especially on single track roads.

Mr. Bryant—I should not be willing to use a spring rail frog with a 56-pound rail, with a hundred trains a day or more traffic.

Mr. Stevens—It seems to me that this question ought to be carried over to another year. There are a good many of our old members that are not here, and I think it would be a good plan to carry this question over until next year's meeting.

President—I will state to Mr. Stevens that it is always customary to have a discussion on previous year's questions—there is a clause that takes up previous questions—so this can be brought up under that head at another meeting.

Mr. Patch—Mr. President, when this resolution is put I should be glad to see a rising vote, so that we can know how we stand on this question.

Mr. Clark—Mr. President, I should not object to having the roll called and putting every one down where he belongs.

Mr. French—Mr. President, I would like to ask the members whether they wish to take into consideration in this resolution the weight of rail ?

Mr. Bryant—I should, for one.

Mr. Bishop—I for another.

Several other members also expressed the same desire.

Mr. Clark—Mr. President, as I understand it, it covers the conditions of the track as we are using it now ; it is under the conditions of rails that we are using now at the present time. Most of us are using heavy rails now, not putting in fifty-six.

President—I think perhaps it would be well to limit it, that is to say, not have it go below a certain weight of rail.

Mr. De More—We have had 60-pound rail on our main line up to last year, on the New York Division of the New York, New Haven & Hartford railroad, and I never knew anything wrong with that ; that always wore just as well as the others. I think myself the 60-pound rail is better than our heavier rail, it always wears better. So I don't see any difference in the weight of the rail much ; of course it is not so strong.

President—One member says, I believe, there has been a spring rail frog in for fourteen, fifteen or sixteen years —there must have been a pretty light rail at that time.

Mr. Patch—Mr. President, I don't think there is any road around New England that would recommend using a 56-pound rail in their main track to-day. For that reason they would not use a spring rail frog with a 56-pound rail. But the spring rail frog that I have in the track to-day, that has been in since 1875—1874 or 1875, I think 1875—that is on 56-pound rail.

Mr. Drew—Mr. President, all spring rail frogs that I have ever used were 56-pound ; I have no other on my division, nor ever have had. They have gone about twelve or fourteen years, and I don't propose to throw them away now, because we consider them all right, and we never had any trouble with them, and don't expect any until they are worn out, which I don't think will be until after I get through.

Mr. French—Mr. President, I think we ought to take into consideration and respect the wishes of every member of the Association on this question. Now we are not going to pass a resolution that one frog is better than another. We simply want to find out what the majority opinion is of our roadmasters here; that will give our road officials an idea of how we feel about it. I therefore make this motion: That we have the President call the roll for a yes and no vote, each member giving his answer to this question: Is not the spring rail frog, when properly and thoroughly made, and with the use of rails above sixty pounds—we might leave that out, but out of respect to some of the members I think we ought to put it in—with the use of rails above sixty pounds. the best and most economical frog for railroads to use, with the understanding that these spring rail frogs are not to be used at junction points and other points where the travel is heavy both ways.

Mr. Clark—Is that a motion?

Mr. French—That is a motion.

Mr. Clark—I will second that motion.

The motion was then put and carried.

Mr. Bishop—I would like to have the motion read just once more, I am willing to be placed on record, but I want to know what I am voting on.

President—The roll is to be called for each member to answer "Yes" or "No" to this question: Is not the spring rail frog, when properly and thoroughly made, and with the use of rails above sixty pounds, the best and most economical frog for railroads to use, with the understanding that these spring rail frogs are not to be used at junction points and other points where the travel is heavy both ways?

Mr. Bishop—If you will strike out that word "best," I will vote for it. I don't question the economy of it at all.

Mr. French—I think the word "best" is a word that ought to remain, to have the resolution contain any weight.

Mr. Bryant—I would like to have you make that seventy pounds instead of sixty.

Mr. French—Mr. President, that is what we want to get at. If there is any objection as to the limit we want to know it.

Mr. Bryant—If you make that seventy pounds, I will vote for the spring rail frog.

President—Will some one make a motion to change it?

Mr. Clark—Mr. President, we could make another resolution after we get through with this, and if there are some who wish to change the weight of the rail let them vote upon that.

President—It seems to me that if we can decide upon the weight previously, it will save another resolution and economize time, as we have other questions to come up.

Mr. Clark—I don't object.

President—If any one wishes to make a motion that we change it from sixty to seventy we will do so, or we will let it stand as it is.

Mr. Paxson—I move that the weight be changed from sixty to seventy pounds and upwards.

The motion was duly seconded and carried.

Mr. Hamilton—I would suggest that the second word, "not," be stricken out, because that might make it ambiguous.

Mr. French—Mr. President, I see no objection to doing that—the second word "not" goes out. So the resolution will read: Is the spring rail frog, when properly and thoroughly made, and with the use of rails of seventy pounds or heavier, the best and most economical frog for railroads to use, with the understanding that these spring rail frogs are not to be used at junction points and other points where the travel is heavy both ways?

Mr. Bodwell—Mr. President, it seems to me that that ought to be changed a little different from that. If we go to work and adopt a frog in that way, it seems to me that that frog ought to be a proper frog to put into a junction. If we want a good frog anywhere we want it there. My experience is, that if you have a good spring rail frog, it is the best and cheapest frog you can put into a junction anywhere.

Mr. Greer—When you say the best you say a good deal, you mean the best, and I think we should use some other word, because there is certainly a difference of opinion here decidedly, as to what is the best. The best surely must mean the safest. I think it ought to be modified in some way or other, so that it would not be quite so strong.

Mr. French—Mr. President, if we were going to pass a resolution, and make it binding upon us, a resolution that one frog is best, or better than another frog, I think it would be well to be very particular about the words we use; but here we are simply going to get the opinion of the members. We are not passing any resolution at all. On account of this difference of opinion we don't think we have a right to hurry through any resolution saying that one is better than the other, but we would like to know the opinion of every roadmaster here, and the only way to get that is to ask each one whether he would use the spring rail or the stiff rail frog under these conditions. Those who do not like the word "best" can, of course answer "no." We want to get an opinion. Engineers, superintendents and roadmasters are not all of one mind on this matter. Some men here have had a large experience, and we would like to get their answers. The only way to bring about a satisfactory state of affairs in this matter is to get the individual opinion of each member. That is what we meet here for. I move that this question be asked of each member, and if each individual member would like to have the question repeated when his name is called, let us do it, it would take but a minute.

President—If there is no further objection, we will proceed with the roll-call. Our Secretary will call the roll, and I hope each member will answer to his name.

The question was again read by the Secretary, who also called the roll, with the following result :

Yeas—Bodwell, Bishop, Braley, Bryant, Clark, Collins, J. W. Drew, French, Greer, Jackman, Lavoix, Lentell, Morrill, Patch, Paxson, Sargent, Stickney, Torr, Jones, Bickford, Glynn, Myron E. Drew, Tuttle, Thornton, De More—25.

Noes—Stevens, Dodge—2.

Mr. French—Mr. President, that question is answered by twenty-five in the affirmative, and two in the negative. Of course we are not passing any resolution, we are simply getting the individual opinions, and can govern ourselves accordingly.

### CARE OF STATION GROUNDS.

President—Gentlemen, I don't see why this does not wind up the discussion on our second question. We are ready and anxious to start and get through with our third question, which is : "Care of station grounds, under whose direction should work on same be done, and responsibility for appearance of grounds rest ?" I will ask the Secretary to read the report of that committee.

Mr. French—As Mr. Clark is chairman, I will hand the report to him.

Mr. Clark (reading the report)—Station grounds to be in charge of man specially appointed for the same by superintendent or roadmaster, and responsible to the one or the other, as the case may be. Three questions : 1. What provision should be made for the care of station litter, ashes, waste paper, etc.? 2. What with locomotive ashes, waste, etc.? 3. What with passenger car litter ?

W. E. Clark, *Chairman of Committee.*

President—Gentlemen, you hear the report of your committee. The question is now properly before you for discussion. I hope each member will speak on it briefly. I think you can give expression to your views in a very few words, because there is not much ground to cover, Mr. French — Mr. President, I think the committee looks at it in a sensible way. This having our station grounds in charge of a station agent, and having all of the work done upon those grounds by another official's men, does not seem to me to be the proper way. I think either the roadmaster, or some man specially appointed, who has charge of the men who actually do the work of cleaning up the grounds, and keeping them in good appearance, should be the man upon whom the responsibility ought to rest, instead of the man who has nothing to do with the men who actually do the work.

Mr. Stevens—Mr. President, I believe the station agent should have charge of the station grounds and should see that they are kept clean. If he has not help enough to keep them clean give him help from time to time. I don't believe it is right to take the trackmen off and put them around stations to keep them clean. I think every station, however, should have some one to keep it clean and in good order.

Mr. French—I agree perfectly with Mr. Stevens, only if the proper amount of help is not furnished the agent, have it understood that the man who does furnish the help is the man who shall say what and how much work shall be done. I don't believe in a station agent having charge of the station grounds, and exercising authority to take men off of our track, simply because he is responsible for those station grounds. The station agent, who is there all the time, ought to have men enough to take care of the grounds, and ought to have the privilege of hiring those men from time to time to clean up, instead of calling upon our track forces. My point is simply this: On a certain road not far away, the rules of the time card read that the station agent shall be responsible for the appearance of the grounds. On that same road the roadmasters are held down to giving the station agent plenty of labor, and he has to take that labor from his track force. If the roadmaster who has charge of the men had charge of the grounds he could say whether the men should go to work and clean up every week or every month.

Mr. Jackman—I would like to inquire why that would not come under the jurisdiction of the superintendent of bridges and buildings ? Wouldn't it be a little out of the jurisdiction of the roadmaster ? I should think it would properly become the duty of the superintendent of bridges and buildings to look out for the surroundings of the buildings.

President—Gentlemen, I will state to you how we are doing this work on the Boston & Albany. I am not bringing this up for an example, but I think it is the only good way. We have on the First Division—in fact, I think we have the whole length of the road, but on the First Division especially—what we call a gardener. He has under his charge in the summer time from five to twelve men, or whatever are necessary to do his work. The Boston & Alpany have been building new stations at most of the places on the First Division. The grounds are graded, planted, seeded and taken care of by this gardener and his men. They cut the grass with lawn mowers. They also keep the weeds and grass from shrubbery. In a few cases where we have stations where the work is limited, the agent is provided with a lawn mower, and in conjunction with the gardener, or acting under his direction, keeps the station clean. I think this is a good way. Also along the roadsides where we have banks graded and seeded, and places where it is kept mowed with a lawn mower, the gardener takes care of that. The terminals at Boston and, I suppose, all terminals, are the worst places to keep clean, and the dirtiest. They will get littered up the quickest. That comes under the section foreman altogether. In Boston, section foreman have one man who every day goes over the section, picks up the papers, and waste matter of every kind, and deposits it in a proper place to be carried away in a car or train, when that receptacle is full. Sometimes one man cannot keep the Boston Terminal clean. Then the whole gang will turn out and help him, perhaps one day in a month, or whatever is necessary. It seems to me that this is the proper way, if not the best way, to do this work.

Mr. Clark—Under whose supervision is the gardener, the roadmaster or the superintendent ?

President—The gardener comes under the chief engineer.

Mr. Clark—That would be in the road department ?

President—Yes, in the road department. He comes under the chief engineer. The grounds are laid out by some civil engineer when they are first laid out. and the chief engineer looks after the grounds afterward, keeps them in order.

Mr. Clark—Mr. President, you must have some rules in regard to this matter that is spoken of in the three questions. Won't you please state what the agent does with his litter, what is done with the locomotive waste, and what with the sweepings of the passenger cars ? If there is not some provision made they will sweep them right out, and ashes they will dump out of the tail end of the train, if there are no rules in regard to the matter.

President—I will state that in years gone by we have had a great deal of trouble with passenger car men, express men, and agents, throwing waste material out of the cars on to the track. This has been practically stopped in the yard. We have at all sidings or yards where cars are stored at night and cleaned, boxes, or large cans, or receptacles, for this waste material, and these different people, car cleaners and agents are supposed to put it in there. Nevertheless, there is always a lot of cinders, waste paper, and everything else, scattered all over the track, and we go over it as often as is necessary, and clean up, with an engine and cars, what this one man cannot accomplish by going over it once a day. At the same time that we have this train go through, all these boxes or cans are loaded on to cars, and carried away into a dump. They will probably get full once a week. Our locomotive cinders are all taken out in our engine houses. We have men on purpose to clean those cinders out, and load them onto cars, and when the car is full, it is taken off to the dump. I believe that answers those questions.

President—I would like to hear from Mr. Bryant, of the Old Colony, Southern Division.

Mr. Bryant—In respect to station agents taking care of the station grounds, that seems to apply to the whole yard. There is much to do in keeping them clean, keeping the rubbish picked up, and the grass cut, and it strikes me that if they had charge of such work we should not have many section men for the work of the track. They would want to see who had the best looking grounds all along the road, who had the neatest station, the neatest grounds, and fixed up the best. I should not be in favor of giving station agents that liberty. It strikes me that the roadmaster has jurisdiction of the road inside of the fences, and that it should partially, if not wholly, include the station grounds. We have a gardener just as they have on the Boston & Albany, who has taken care of our grounds, but all the litter from engine houses, and around depot grounds the section men have had to clean up, and the roadmaster was also called upon to furnish all the loam and to do most of the grading, and it takes a good deal of time, and is a great detriment to the track department in doing this work. It strikes me that it should come under the chief engineer or roadmaster, and that there should be a special gang to clean up all this rubbish. In Boston we have a gang that cleans up the engine houses, and the rubbish goes in two or three cars, or sometimes four, as the case may be, to South Braintree, where we have a dump. But I should not be in favor of giving the agent power to take men from the track, or take any men from the service of the road or track department, to clean up his grounds.

Mr. Clark--Mr. President, I think that every man, whether in the locomotive department, or in the road department, station agent or whatever he may be, should be held to a strict accountability, and required to take care of his own litter in some way. I don't think an engineer should go along the road or in the yard, and scatter ashes and cinders from one end to the other, simply because his fireman is too lazy to clean them out at the end of his trip.

I think that should be wiped out, as well as the practice of dumping trash from passenger cars or the cleanings into the yard, or a man going into a car that is filled with litter and sweeping it out on the ground to be cleaned up. I think every man should be held to a strict account about taking care of his own litter. If rules were made and required to be enforced, it would do away with an extra day's cleaning up. I don't think those things should be tolerated or allowed in any way. I don't believe section men should be required to clean up after those people. I think they should be required to dump their ashes and litter in a proper place provided for it.

Mr. French—Mr. President, I move that a committee of three be appointed by the chair to answer the three questions which the committee submits, and to prepare a resolution on the whole report.

The motion was duly seconded and carried, and Messrs. Patch, Bryant and Sibley appointed as such committee.

### GRAVEL PITS, BALLASTING, ETC.

President—Gentlemen, I don't see why it would not be perfectly proper, while this committee is out, to start the discussion of the next question, and get it going, as our time is limited. Our next question to be discussed is, "Importance of railroads owning good gravel pits; economy of using good ballast in roadbed maintenance; best and most economical method of loading and unloading ballast." Are the committee ready to report? Mr. Greer, I believe is the chairman of that committee.

Mr. Greer—Excuse me, Mr. President, but Mr. Shanks, I have been informed, is chairman, if he is in the room.

President—Mr. Shanks is not here.

Mr. Greer read the report of the committee, as follows:

Mr. President, Your committee respectfully recommend that all railroad companies own good gravel beds suitable for good ballast, and as free as possible from dust.

The great advantage gained by having your track well ballasted, is that it will not heave in winter, therefore saving the great expense of shimming.

Shimming not only causes a great deal of labor during the winter months, but causes a great deal of re-spiking and cutting of ties, thereby destroying their life.

Your committee think there is no better opportunity for reducing the operating expenses of a railroad than by having track well ballasted. With good ballast your track is in almost as good condition in winter as in summer, so that a lot of extra labor is not needed in the spring to get the track in proper line and surface for summer business.

In regard to loading and unloading ballast. The cheapest method in our judgment, is to load with a steam shovel and unload with a mechanical ballast unloader.

SAM'L GREER, N. Y. N. H. & H. R. R., *Committee.*

President—Gentlemen, this question is now properly before you for discussion. It is a very important one, and I have no doubt that we shall hear some good remarks upon it. I would like to have some gentlemen here who has had a large experience in raising track and ballasting, give us his ideas, to put the ball in motion. I would call on Mr. Collins, of the New York, New Haven & Hartford road.

Mr. Collins—There cannot be any question about the advisability of any railroad company owning a good gravel bank. It is certainly a great success for the track department. With good gravel we can give them good track at all seasons of the year. With regard to loading and unloading, of course different circumstances require different methods. If we have much to do, load by steam shovel, and either load into dumps, or if you have a contrivance for unloading, use the unloader. I have never seen any of those work, and of course cannot speak from experience concerning them. If you have not much to do, and want only a little gravel here and there, I should say load it by hand on flats, and unload it as your train moves, getting it more even and just as you want it.

Mr. French—Mr. President, I know we all understand the necessity of having good ballast under our track, but I think we can make some remarks here to-day that will show our higher officials the great need of it, so that when we ask them to buy a gravel bank, they will look upon it as something that we cannot get along without. I don't think they realize that all the labor of shimming that we do in winter is thrown away, besides destroying the ties, so that we have to take them out after they have been in perhaps only one or two winters. I wish we could make such remarks as would impress upon our officials the advantage and importance of buying these gravel pits. We understand the necessity ourselves. Now as to the unloading of ballast. There are several kinds of ballast unloaders. We all know that it is much cheaper to have two trains and have a steam shovel, and some kind of a device for unloading ballast, so that the men can remain on the track and be at work all the time, instead of riding from the place where the gravel is dumped, back to the pit, and riding out again to shovel it off by hand. We understand that we should have two trains and a steam shovel, so that our men can be at work all the time, instead of riding to and fro. I would like to have the members who have had experience with the different ballast unloaders tell us about those machines, what the cost of them is, the expense of maintenance, whether the results are satisfactory, and which machine gives the best satisfaction.

President—I would call on Mr. Hamilton to say what he uses on his road.

Mr. Hamilton—May I suggest that you call on Mr. Greer, as knowing more about that than I, and having had more practical experience?

President—Mr. Greer is called for.

Mr. Greer—I can simply tell you what we use in raising track to go over highways. We use a Barnhardt single track unloader, and usually ten cars in a train. We can unload the ten cars, from the time we stop and are ready to start again, in from four to five minutes. We have no aprons over the end of the cars, consequently some drags off across the track, and we have got to clean that up so that we can pass on. I don't think it is always advisable to unload gravel with an unloader; that is, where you are dressing up or patching up banks, if you want a little raise in a little sag of two or three inches, or want to fill in, or the like of that, because you can throw off better with your shovels just what you want. If you start the unloader at all, you have got to pull it all off. If you are going to raise a foot or so, the ballast unloader is a very nice thing, because you can do it readily and reduce the expense. Where there is a quantity to be moved, I would recommend the steam shovel and the ballast unloader.

Mr. Drew—Mr. President, brother Collins voiced my sentiments exactly, although this is a very broad question. The greatest trouble, in my opinion, is to convince railroad managers or superintendents, and get them to furnish the means to carry out these things. As to those patent dumpers, I never had anything of the kind, although I have ballasted a great many miles six, eight and ten inches, and almost always did it with flat cars, and a two-legged steam shovel. If a man is doing a great deal of work, raising track two feet, of course the steam shovel is the thing. I never have seen any of these patent dumpers that were adapted to skip along and ballast up the track three, or four, or five, or six inches as you wanted it. The only way I could do was to use flats, and shovel off the material just as we wanted it. It usually wants more in one place than it does in another. But in my opinion, our great trouble is to convince railroads managers that there is economy in having these things. They don't have to attend to it. It takes me all summer to get my track fixed up where it gets askew in a bad winter. But we cannot convince them. You cannot convince them that frost does much injury to track, because they don't have any trouble with it themselves ; they only get shook up a little, occasionally, nothing serious, however.

President—I would like to ask Mr. Greer what power he uses to unload his ballast ?

Mr. Greer—Use an engine of about eighteen inches cylinder.

President—Inches in diameter, or in length?

Mr. Greer—In length. Hitch it to a steel rod an inch and three-eighths in diameter the length of five cars.

President—You would uncouple the engine from your train ?

Mr. Greer—Uncouple the engine and hitch onto this rod, and start the engine, and drop the load.

President—In that way you would have to unload all the cars, even though you did not want to have the whole of it at that point ?

Mr. Greer—Yes. In case we were dressing up, and we would want a little on that side, and a little on this side, we would stop the train and have men throw off a little from this car, or most off that car, and none off the next car.

Mr. Drew—Do you have any difficulty in holding your train while dumping ?

Mr. Greer—We do some. In good loose gravel we don't have any trouble, because it draws easy enough so that the wheels will not slide ; but when loaded with clay and heavy material we have found it necessary to chain the rear truck to the rail.

Mr. Collins—Mr. President, I had brought to my notice last fall a device which I was very favorably impressed with. The equipment is a set of flat cars with a bottom so constructed that you can open them part way or more, as you wish. If you have a long piece of track to raise and re-ballast, the first thing would be to raise your track two or three inches and get your ties up out of the bed, then to go along and get your gravel out of these cars, open them according to the quantity of dirt you wish, and start your train. The gravel will then run out and fill the track full, if you wish to have it, governing it by your speed and by the opening in your cars. In the rear of the last car is the plow, which extends out to the end of the ties and levels your gravel down. Your track is full of gravel, and there is none to push out into the ditch. Your men haven't got to handle the gravel at all, it is just where you want it. Then if you wish to raise again you are all ready to do it. It seemed to me that for re-ballasting and raising track that was a great labor-saving contrivance. Of course there may be things come up in actual service that might make it look differently.

Mr. Hamilton—Mr. President, I want to ask some of these men of large experience whether it is economy to raise track as little as two inches, whether the track should not be raised from four to eight or ten inches and ballasted.

President—I suppose you ask that on account of Mr. Collins saying to raise the track two or three inches. I understand why Mr. Collins made that remark. That was simply the first raise, and after he had got his ballast out he would bring it up more. This is so as to get room for the ballast down among the sleepers, as I understand it.

Mr. Collins—That was it, to make more room for your ballast, merely to get your track started. You could get enough of your ballast at one unloading sufficient to do the whole work. Whereas if you bring your ballast there when your track is full even with the ties, you might not be able to unload so much as is necessary to do the work. But when you begin to raise by lifting your track from the old material, you would be able after unloading to raise it from eight to ten inches.

Mr. Drew—I would ask Mr. Collins if at the time of dropping the gravel inside of the rails there was any way in which the track could be filled up outside of the rails.

Mr. Collins—Yes. This plow that they have in the rear of the last flat would reach out to the end of the ties and would level the gravel to that extent. Of course if there was more gravel dumped than the track would hold underneath, this plow would push that out in the ditch. That is where the foreman's judgment should be exercised. The strong point of this device seemed to me to be that you would get your material just were you wanted it without handling it again.

President—I would like to ask Mr. Collins if he ever saw this machine at work ?

Mr. Collins--No. The gentleman showed me the cars, and explained to me the working as he had seen it work. I merely bring this up as being one of the devices in conformity with Mr. French's remarks. In actual service it might work differently.

Mr. Hamilton—It has been my practice to make about two raises, varying from twelve to fourteen inches, making the first raise from the first carload of ballast that was spread along the track, and then come a second time and make a second raise.

Mr. Paxson—I would like to ask Mr. Greer whether with the ballast unloader there is anything gained on sharp curves, whether it is practicable to use it on sharp curves.

Mr. Greer—Yes, I think you can work around curves. This, you understand, is not the old fashioned kind. This unloader that I am speaking of is the new fashioned kind that has stakes about eight inches high, one stake every four feet or four feet and a half, the entire length of the car and the train. Consequently there is a guide on each side in advance of the plow that pushes the gravel to keep it right. By using a rope which is only five cars in length it is possible to draw around 6-degree curves very successfully ; but when you come to eight, ten and twelve, and the like of that, I would rather take a little time and unload by hand on that part.

Mr. Paxson—Mr. President, I would like to ask Mr. Greer whether he ever finds it necessary to use a snatch block in unloading on a sharp curve.

Mr. Greer—No, I never have.

Mr. Paxson—I just merely asked for information. If I continue on the road I shall be likely to have a great amount of that work to do, and it certainly strikes me as economy to use a ballast unloader.

President—We would like to hear from Mr. Stickney, if he is in the room.

Mr. Stickney—I have only just come in, Mr. President, and I am not posted on the question under discussion.

President—I will try to inform you, as some of the members have called for you. We are discussing the question, "Importance of railroads owning good gravel pits; economy of using good ballast in roadbed maintenance; best and most economical method of loading and unloading ballast." The last part of the question is what we were discussing principally.

Mr. Stickney—The only method that I have ever adopted was either shoveling out of flat cars by hand or using dumps. I had an unloader and used it two days, but it had more of a tendency to climb, perhaps, than it did to shovel ballast off. It was an old fashioned affair that I was trying to put in order. The Boston & Maine railroad have one or two of the Barnhardt ballast unloaders, of the same kind, I should judge, as Mr. Greer speaks of, but I never had any chance to use them. I understand they are using one of them on the northern division of the Boston & Maine, but with what results I do not know. As far as I am concerned I have used dump cars or shoveled it off by hand. If there was any large amount of ballasting to be done, I should say that a ballast unloader would be preferable to dumping from cars, although you have to be governed by circumstances to a certain extent. If you are simply raising track five or six inches I should think it would deposit more, and to a great deal better advantage, than a dump car, which would place it all in one place.

President—I would like to ask Mr. Greer one question. If you had a fill to make of, say, a number of thousand yards, within a short distance—and we will limit the dump or fill, perhaps, to ten or twelve feet, irregular up and down—which would be the best way of unloading, with dump cars, or with the ballast unloader, a side fill?

Mr. Greer—A one side fill—dump cars by all means, or else a double track ballast unloader. You can get those. What I mean by that is that the ballast unloader will throw all the load on this side. When you want to throw all the load on the other side, you simply take your cars to the turntable and turn the whole thing around. A flat car is considered by every railroad man a decidedly safer car to run on main lines, especially double track lines, because there is trouble about old dump cars breaking down, and tipping up, and getting in the way of trains when you are in a hurry and can't get out of the way. Oftentimes you have to back up, of course going in the wrong direction, in the way of a train. So I say, by all means use the flat car if you can. If you have got a lot of dumps, of course for a small job, I should say use dumps.

President—Of course in filling a dump of a number of thousand yards you would use more than one train ?

Mr. Greer—Certainly.

President—Isn't there a great deal of delay in switching to get your plow in the right position ?

Mr. Greer—Well, sir, the plow is always, of course, at the head when you start to go back to the bed. The first thing we do is simply to switch it to a side track which I always have built for that. The rope always remains exactly where you drop it, right in the middle of the track, we will say. If you don't want it where that rope was left, and want to go back to the rear end, you back up your engine, and when you come to it you take it up and hook it on to your draw-bolt, and draw it back to where you want it. The delay is very slight, switching that plow back to the rear, and when you get used to it, you don't make anything of it at all.

Mr. Dé More—We are doing a great deal of that kind of work, raising our track about ten feet in the main line. I don't know as I can improve any on Mr. Greer's remarks, although in making a side fill, we unload it all one way, and we also have a leveler, which we constructed ourselves, and when we unload we pull the engine right back, and open a wing out, and she pushes the stuff all down the bank fifteen feet. Every other way we do just as Mr. Greer does. We are trying to get up an arrangement now to have our cable hooked up, so that all we have to do is to run under it, and push our cable out, and drop it right onto our cars. I don't know as they have got that quite completed yet. When we first started this business we did it mostly by hand. We had a steam shovel and unloaded by hand, but we couldn't make any headway with that method, so we have unloaders now, and unload both ways. With the unloader we can unload from eighty to one hundred cars a day. I did know the figures that it cost to do the work, but I have forgotten them, I could not tell you. It seems very cheap.

Mr. French—Mr. President, Mr. Stickney spoke of a ballast unloader upon the northern division of the Boston & Maine, and there is one man from that division here, Mr. Jackman. I would like to have him called upon, and asked if there are any difficulties in using that ballast unloader.

President—Mr. Jackman is called for.

Mr. Jackman—Mr. President, I will say that the unloader that Mr. Stickney refers to has been used on the upper end of the division by Mr. Smith, and I never saw it used; but he says it works complete; he is very much pleased with it, and says it works to a charm.

President—What kind of an unloader is this, Mr. Jackman?

Mr. Jackman—I think it is the same that Mr. Greer refers to, I forget the name.

Mr. French—The Barnhardt?

Mr. Jackman—Yes.

President—Uses the locomotive for power?

Mr. Jackman—Yes, just uncouple your train, and hitch on the cable. I think on a sharp curve he uses a snatch-block.

Mr. Greer—I would like to explain a little more about this ballaster. Because there are some members here who have not used them, and after they get home they will begin to think about this ballaster, perhaps, and there may be some little difficulties come up in their minds about it. I can explain one thing that has not been brought out. If we commence to ballast a new track that has just been laid down, of course we don't take a great deal of pains about keeping it exactly true to surface and line, and all those things. We want to get the gravel on just as quick as we can and get it started. I first thought, of course, that the ballast unloader would not carry from one car to the other without tolerably good line and good surface. As we advanced the work and kept raising up it would leave it in pretty bad condition. But this advanced mould board has an advanced runner, which will regulate the plow and raise it up or lower it down, so that you never catch the end of your car at all. You can also regulate the grade of your plow, and nobody need be afraid but that the plow will go over rough track without catching.

Mr. French—I would like to ask Mr. Greer how many cars he can use with a ballast unloader ?

Mr. Greer—You can use ten easily. It depends upon how many you have got steam to pull.

Mr. French—On curves ?

Mr. Greer—Yes, up to a 6-degree curve. I never tried anything more than that. That is my experience.

President—I see that our Secretary is looking at me pretty strongly, as if he wanted me to tell you something about what we are using, and I suppose I shall have to do it in order to keep him still. The Boston & Albany bought last spring what they call a rapid unloader, a gravel ballaster. The name of the inventor has left my mind, but it is called the rapid unloader. The plows, I take it, are similar to what you already are using. But we have an engine on a car to do our unloading, we are not dependent on the locomotive at all. We can work a train of twenty cars, ten yards to a car—nine or ten commonly—with that unloader. If you don't want all the load in one place the locomotive can move along so as to get half of the ballast, perhaps, more or less, in one place. If you want all in one hole, the locomotive can move in the opposite direction your plow is going, and you get it all off in one hole. It is a very nice way of distributing ballast, and I should think an improvement on locomotive power. Previous to this year we have always used a dump car. We have used different sizes. The old 4-yard car has always been my favorite, and previous to this year I would not change it for anything that I had ever seen, but I do think the gravel ballaster for raising track is a great improvement. It saves time and labor. We use on the Boston & Albany a train of twenty cars. The cable is about an inch and a quarter and is three hundred feet long. It has a large drum which it is wound over, and, as I said before, we can distribute the ballast as we want it. We have two plows, one to work one way and one to work the other way. We put the plow on whichever way we want to throw the ballast. If we want to throw the ballast to the right we put on a right hand plow, and if to the left we put on a left hand plow. It requires only two men, one man to look after the plow, and one to run the engine. There is no boiler connected with the engine, but it takes steam right from the locomotive. We have aprons between our cars, so that practically no ballast goes between our cars. The aprons are made of sheet iron. They go on with hinges on one car, and drop over on the other. They are made reversible, so that whatever way you are throwing, it will be against the hinged side of the apron. I think it is a very good thing for ballasting track; but for track work, or for an upper side fill of a number of thousand yards, I prefer yet the dump car.

Mr. Greer—That dump car cost me a good deal. I used them when I was much younger than I am now, and I pushed up on them, and I pulled down on them. If you prefer a dump car you have got a better lot of dump cars than I ever saw yet. It is no fun to be anchored on dump cars; I have graduated from them.

President—I will say to Mr. Greer that I have one steam shovel to work where we are averaging from fourteen to fifteen hundred yards a day, and that we are using dump cars altogether. In fact, now we have three dump jobs that we are working on, side filling, where I am using dump cars, and I have got fifty flat cars on the side track with a rapid unloader and two plows that are not in use.

At the request of the President, Mr. French takes the chair.

President *pro tem*—If there are no further remarks on the question of unloading ballast, as I see that the committee has come in that is to report upon the third question, I will ask if that committee is ready to report. We would like to hear from the chairman or representative of that committee.

Mr. Sibley—The chairman has just gone out, and left a memorandum of a report, which I will present. We answered the three questions asked. The first question was, "What provision shall be made for the care of station litter, ashes, waste paper, etc.?" To that the committee make this reply: There should be places arranged at all stations for emptying ashes, papers, waste, etc., which should be collected by the station men, or men for that service, other than section men, under the control of station agents, and the collected rubbish to be taken care of by the road department. The second question was, "What with locomotive ashes, waste, etc.?" and we make this answer, that all old waste should be taken care of by parties using it, and cinders, sparks, etc., should never be dumped except at spark beds or engine houses. And in reply to the third question, "What with passenger car litter?" we say, all parties cleaning cars should put all rubbish in places arranged for station litter, which should be taken care of by the road department.

Mr. Jackman moved that the report be accepted and adopted as the sense of the Convention, and the motion was duly seconded and carried.

President *pro tem*—As we are approaching very rapidly the time when we shall adjourn, and as we would like to have all the members here just before we do adjourn, on account of one or two matters we wish to act upon, I would like to appoint Mr. Collins a committee of one to circulate around a little and ask each member to come in and stay with us during the next fifteen or twenty minutes, so that we can have all the members here when we adjourn—if Mr. Collins will kindly do so.

The President returns to the chair.

Mr. Drew—Mr. President, if I am not out of order I have a little document that I would like to read and have it brought up before the Association.

President—Is it in regard to the question we are discussing?

Mr. Drew—No, sir.

President—Then, if you will please wait until we have disposed of that we will hear you. As it is getting late, is there any further discussion to be had on this question? If not we had better have a committee appointed and close it up, and if there is no objection we will have that committee appointed.

Mr. French—Mr. President, we have just appointed a committee, during your absence, to try and get all the members to come in here, as we shall probably close in about fifteen or twenty minutes, and rather than appoint a committe of three to leave the room now, I would move that we accept the report of the committee on the fourth question, as it now stands, as the sense of this Convention.

President—I would like to have that report read—I have forgotten just how it reads—and perhaps some of the other members would like to hear it also.

Mr. French read the report of the committee.

The motion was duly seconded and carried.

President—The next business to come before this Convention is, Review of previous year's questions. Has any member anything to say on that subject? Mr. Secretary, what other business is there to come before this meeting? I suppose there is one thing that might properly come up now, or very soon, and that is the place of meeting next year. Are there any remarks to be made on that?

Mr. Clark—Mr. President, if it is in order, I would make a motion that we meet in Boston. We have tried a departure from this place, and I do not think it resulted successfully. I don't know of any better place to meet than where we are now; not in this hotel necessarily, but in Boston, leaving the exact place in the hands of the President and Secretary, and leaving them to make arrangements for the meeting next year at the usual time.

President—That is left to your Executive Committee.

Mr. Clark—With the same parties as last year. I move that our next annual meeting be held in Boston the third Wednesday in August, 1894.

The motion was seconded by Mr. French and carried.

President—Mr. Secretary, is there any further business to come before the meeting.

Mr. French—There are one or two other matters. The entertainment committee has brought a programme, showing the bill of fare for dinner at Bass's Point, and probably the chairman of the committee can give us further information. Mr. Bodwell says he would like to talk with the members after the meeting closes. I will simply read what you can expect at dinner: Clam chowder, broiled rock scrod, baked bluefish, fried clams in crumbs, deep sea perch, fried lobster, Nahant chips, iced cucumbers, dressed lettuce, radishes, etc. For dessert, ice cream, cake, fruit and coffee. The boat leaves at 2.20 this afternoon, and those members who want to go down and yet have got to be in Boston before the boat returns at 9.30 to-night, will understand that there is a means of conveyance from Nahant to Boston by taking the stage from Nahant to Lynn, two or three miles, and then taking trains to Boston. The boat reaches Bass's Point, as I understand it, at 3.20, so that they can get back to Boston by five or six o'clock if they must. But of course it would be an advantage to have all remain and come home together.

President—I hope every member will take this opportunity to go down the harbor; it will surely be a good, jolly party, and the more the merrier.

Mr. French—Mr. President, it has been customary to pass two or three resolutions about this time. I have written out a couple and perhaps some of the other members will think of other resolutions such as we usually pass before we adjourn. One is, Resolved that our thanks are due to the representatives of the numerous manufacturers of railroad appliances exhibited at this Convention, for the benefit derived from the varied display so conveniently arranged for our inspection. Our Convention would certainly not be a complete success without the aid of these supply men, and we would like to pass this resolution, thanking them for their presence, and for having so many devices so conveniently arranged for our inspection.

The resolution was seconded by Mr. Clark and adopted.

Mr. Fredch—In addition to that resolution of thanks to the supply men I have another resolution, and perhaps the members will think of others. Resolved. that the thanks of this Association be extended to the General Superintendent of the Boston & Maine railroad, for the courtesy shown us in having a special conveyance from the Eastern depot out to the place where we could inspect the new track work in connection with the Boston & Maine union station.

The resolution was duly seconded and adopted.

Mr. French-–Our President suggests a resolution in addition to the vote of thanks which we have just given to the supply men for the benefit which we have received from them : he wishes to have a second resolution thanking them for the attention they have given to our ladies, and the courtesies they have extended to them. I move we make this one of our resolutions.

The resolution was seconded by Mr. Sibley and adopted.

Mr. French—Mr. Ellis wished me to say, in regard to the photograph we had taken out at Prison Point this morning, that he will arrange the matter so that all of us can obtain one of those pictures, and we will advise you later by mail in regard to it.

President—Have the members of the entertainment committee any other remarks that they would like to make ?

Mr. Bodwell—I don't think we have anything further to say.

Mr. French—Are we going down to the wharf by stages, or by separate carriages, or by horse cars ?

Mr. Bodwell—Probably we will go down by horse cars.

Mr. French—Mr. Fisher, of the Page Woven Wire Fence Company, has come on from Chicago, and has stretched a piece of his fence several rods long down in the yard. He could not have it in the regular exhibition rooms, and out of respect to him, as he has come such a long distance, two or three of the members have spoken to me about our going down there in a body to see his exhibit. He will explain this new wire fence and the method of putting it up.

Mr. Drew—Mr. President, will you please inform me when I am in order to present this document ?

President—I beg Mr. Drew's pardon, it almost entirely, and, in fact, had entirely slipped my mind about the paper that you wished to submit. You now have the floor.

Mr. Drew—Resolved, that as the "Roadmaster & Foreman," published at Chicago, Illinois, is a paper devoted entirely to maintenance of way and the general advancement and welfare of trackmen, we recognize the same as the official journal of the New England Roadmasters' Association, and that the Secretary be instructed to send to the publishers a copy of all matter intended for publication, thereby affording a broader publicity to our proceedings, especially among section foremen, to whom the greatest consideration is due. We never have had any official paper or mouth piece of this Roadmasters' Association.

Mr. Hamilton—Mr. President, while there is an opportunity for improvement in the paper, I think it is in the interest of our Association that we should do all we can to build up some paper. That seems to be the accepted one, and I move that the resolution be adopted.

The motion was seconded by Mr. French and adopted.

President—Gentlemen, we are about to close this our Eleventh Annual Convention. I think it has been a very interesting one. I thank you for the courtesy you have shown me as your presiding officer, and without your help I never could have gotten through in this position. I am not going to make any remarks. I am not a speech maker. I simply thank you for your kindness towards me, and on leaving this chair I shall not lose my interest in this Association, but in years to come, if I should live and be engaged in railroad work, I shall endeavor to always meet with you. I don't know as I have anything more to say.

Mr. Secretary, is there anything further to come before the Association ?

Mr. French—I know of nothing more. Mr. Davidson, of the entertainment committee, says that the members should leave here at 1.50 o'clock, in order to get down there at 2.20. Perhaps he has devised some means of conveyance for us, I don't know as to that. I hope the members will not fail to go down and see this wire fence exhibit.

Mr. Bodwell—It is understood that the members will all meet at the house here at 1.50, and take the horse cars.

Mr. French—I almost forgot an important matter. Some of the members have not paid the assessment for this year. I wish all of those members who have not paid, and perhaps some new members who have not paid their initiation fee, would step up here immediately after adjournment, so that we can settle that part of it right away. I have not given receipts to the members because I have been so busy doing other things, but I will either hand receipts to you before you leave, sometime during the afternoon, or will mail them to you.

Mr. Bodwell—With regard to the tickets on the boat, Mr. Davidson will furnish the members of the Association with tickets at the gate to the steamer landing.

President—Is there anything further to be said ?

Mr. Hamilton—I would like to move a vote of thanks to the President and Secretary of this organization, for the very able manner in which they have cared for its affairs during the past year.

President—Who will put that question ?

Mr. French—Mr. President, I don't see how we can do anything but accept.

President—I will state that a vote of thanks should be extended to our Secretary, he has done all the work.

Mr. French—Mr. President, I have been Secretary of the Association through several administrations. I cannot say a word against any of our former Presidents, who have all done good work, and shown a great deal of interest, but we never had a President who was more interested in our welfare than the present incumbent of the chair. The thanks of this Association are due to Mr. Lentell for the earnest work that he has put in during the past year. I know all about it myself, and I wish I could explain to you how many times he has written me about one thing and another, and how we have discussed these matters at our different Executive Committee meetings. There is a great deal of work in connection with carrying on our Association, and of course it has fallen upon a few. There have been times during the Executive Committee meetings that we have had, when it has been almost impossible to have the full board present. I hope that during the next year whenever there is a call sent out for an Executive Committee meeting, every member of it will attend. We cannot do much unless we have the full board ; it is the action of a few men, unless all are there. We don't want any one man to run this Association. We want to get the opinions of each and every member, and I hope that the full executive board will be sure to be present at every meeting during the next year, and that they will work for the interests of the Association.

President--Gentlemen, is there any further business to come before the Association ? If not, we will consider this Convention closed, and I so declare it.

# MEMBERS.

| | | |
|---|---|---|
| Aldrich, M. W. | N. Y. & N. E. R. R., | Needham, Mass. |
| †Bickford, C. E. | Maine Central R. R., | Lancaster, N. H. |
| †Bishop, G. W. | F. R. R., | Athol, Mass. |
| †Bodwell, S. B. Jr. | B. & M. R. R., | Lawrence, Mass. |
| †Braley, B. | N. Y. N. H. & H., | Brockton, Mass. |
| Brennan P. D. | Nar. Pier R. R., | Peacedale, R. I. |
| †Bryant, E. H. | N. Y., N. H. & H., | New Bedford, Mass. |
| Clark, F. C. | N. Y. N. H. & H., | Falls Village, Conn. |
| †Clark, W. E. | B. & M. R. R., | Charlestown, N. H. |
| †Collins, R. P. | N. Y., N. H. & H., | Readville, Mass. |
| Daggett, G. E. | | Stamford, Conn. |
| †De More, G. A. | N. Y., N. H. & H., | Stamford, Conn. |
| Dearden, W. F. | | Richmond, P. Q. |
| †Dickey, T. J. | F. R. R., | Boston, Mass. |
| †Dodge, F. E. | M. & W. R. R. R., | Woodsville, N. H. |
| †Drew, J. W. | N. Y., N. H. & H., | Hyannis, Mass. |
| †Drew, M. E. | N. Y., N. H. & H., | Hyannis, Mass. |
| †Ellis, W. F. | 620 Atlantic Ave., | Boston, Mass. |
| Follansbee, G. H. | F. R. R., | Keene, N. H. |
| †French, G. L. R. | B. & M. R. R., | Boston, Mass. |
| Garrison, D. C. | S. L. & N. R. R., | Roxbury, Conn. |
| †Glynn, H. J. | N. Y., N. H. & H., | Fall River, Mass. |
| †Greer, Sam'l | N. Y., N. H. & H., | Westfield, Mass. |
| Hammond, H. N. | | |
| †Hathaway, E. O. | | Springfield, Mass. |
| †Hamilton, M. C. | N. Y., N. H. & H., | Hartford, Conn. |
| Holbrook, F. | | Stamford, Conn. |
| Hutchinson, Wm. | B. & M. R. R., | Nashua, N. H. |
| Hyland, R. | F. R. R., | Keene, N. H. |
| †Hyde, F. H. | B. & A. R. R., | Newton, Mass. |
| †Jackman, E. E. | B. & M. R. R., | Franklin, N. H. |

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†Members present.

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| †Jones, C. H., | N. Y.,N.H. & H., | So. Middleboro,Mass. |
| Kilcourse, John | N. Y., N. H. & H., | Danbury, Conn. |
| Lane, C. S. | | Waterbury, Conn. |
| Lane, J. S. | | Hartford, Conn. |
| †Lavoix, Chas. | B. R. B. & L. R. R., | Winthrop Junc., E. Boston, Mass. |
| †Lentell, C. B. | B. & A. R. R., | Boston, Mass. |
| †Loomis, E. R. | N. Y., N. H. & H., | Hartford, Conn. |
| Ludwig, W. B. | W. R. R., | Waldoboro, Me. |
| †McManama, J. W. | F. R. R., | Boston, Mass. |
| Merrill, W. H. | C. N. E. & W. R. R., | Rhinecliff, N. Y. |
| †Morrill, E. | B. & M. R. R., | Lawrence, Mass. |
| †Mosher, W. T. | | |
| Muzzey, L. M. | B. & A. R. R., | Chatham, N. Y. |
| McQuaid, R. A. | B. & A. R. R., | Chatham, N. Y. |
| Nevens, Geo. | M. C. R. R., | Brunswick, Me. |
| †Osgood, C. S. | P. & R. F. R. R., | Hartford, Me. |
| †Patch, J. R. | B. & M. R. R., | Springfield, Mass. |
| †Paxson, S. C. | N. Y., N. H. & H. | Westfield, Mass. |
| Perkins, P. S. | N. Y., N. H. & H., | Providence, R. I. |
| Post, E. K. | N. Y., N. H. & H., | Hartford, Conn. |
| †Sargent, F. M. | N.Y.,N.H.&H., | So.Framingham,Mass. |
| Shanks, J. L. | F. R. R., | No. Adams, Mass. |
| Shanks, J. W. | C. V. R. R., | St. Albans, Vt. |
| †Sibley, F. F. | N. Y.,N. H. & H., | Middletown, Conn. |
| Sisk, John | N. Y. & N. E. R. R., | E. Hartford, Ct. |
| †Slafter, C. S. | N. Y., N. H. & H., | Readville, Mass. |
| Smith, R. R. | B. & M. R. R., | Canaan, N. H. |
| Spaulding, L. J. | F. R. R., | Ayer Junc., Mass. |
| †Stevens, A. C. | B. & M. R. R., | Beverly, Mass. |
| †Stickney, A. C. | B. & M. R. R., | Lowell, Mass. |
| Stone, E. E. | B. & A. R. R., | Springfield, Mass. |
| Sullivan, T. J. | B. & A. R. R., | Westfield, Mass. |
| †Thornton, G. K. | B. & M. R. R., | Ware, Mass. |
| Toomey, D. | N. Y. & N. E. R. R., | Norwich, Conn. |
| Torr, Jas. M. | N. Y., N. H. & H., | Woonsocket, R. I. |
| †Tuttle, W. E. | N.Y.,N.H.&H., | So.FraminghamMass. |
| Walker, John | B. & M. R. R., | Nashua, N. H. |

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†Members present.

# CONSTITUTION AND BY-LAWS.

**As Amended to August, 1893.**

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## PREAMBLE.

We, the undersigned roadmasters, for the purpose of securing more perfect harmony, imparting more general information, and promoting the general welfare of each other, and the roads we represent, form ourselves into an organization, and frame the following Constitution and By-Laws.

## ARTICLE I.

SECTION 1.—The name of the Organization shall be called the "New England Roadmasters' Association."

## ARTICLE II.

SECTION 1.—The officers of this Association shall be a President, Vice-President, Chaplain, Secretary and Treasurer, and Executive Committee of seven, including the President, Vice-President, Secretary and Treasurer. The President shall be chairman of the Executive Committee.

SEC. 2.—All the officers shall be elected by ballot at the annual meeting, a majority of all the votes cast shall be necessary for a choice.

SEC. 3.—The President, or in his absence the Vice President, shall preside at all meetings. In case of absence of both President and Vice-President, the members may elect a President to act pro tem.

SEC. 4.—The Secretary shall keep the records of the Association and Executive Committee, audit all correspondence, and issue notice of all meetings of the Association and Executive Committee, and collect all fees and dues, pay them over to the Treasurer, taking his receipt therefor.

SEC. 5.—The Treasurer shall keep the accounts and be charged with all the funds of the Association, and disburse them under the direction of the Executive Committee, and shall at the annual meeting, or at any other time, if required by the Executive Committee, furnish a statement of funds, income and expenditures to the Association.

SEC. 6.—All bills against the Association must be approved by three members of the Executive Committee before they shall be paid.

SEC. 7.—The Executive Committee shall have the general management of the Association. Three members of this Committee shall constitute a quorum at any regular or special meeting of the Committee.

SEC. 8.—Vacancies can be filled pro tem by the President, or permanently by a majority vote of the members present at any regular or special meeting.

SEC. 9.—All officers of the Association shall continue in office until the close of the meeting at which their successors are elected.

## ARTICLE III.

SECTION 1.—Regular annual meetings of the Association shall be held at some place in the New England States, on the.............................................................................. Special meetmay be called by the Executive Committee, or by vote of the members at any regular or special meeting. Seven members shall constitute a quorum of all the meetings of the Association.

SEC. 2.—The order of business shall be as follows :

1. Reading of minutes of last regular and intervening meetings of the Association,
2. Secretary's Report.
3. Treasurer's Report.
4. Roll call.
5. Enrollment of new members.
6. Reading of Communications.
7. Election of officers.
8. Report of committees.
9. Unfinished business and miscellaneous business.

SEC. 3.—Place of holding next annual meeting shall be decided by a vote of members present, or by the Executive Committee, of which all members shall receive due notice.

## ARTICLE IV.

SECTION 1.—Any Roadmaster or Assistant Roadmaster, or Engineer of maintenance of way, in good standing on a regularly operated railroad in the New England States, the British Provinces, and east of the Hudson River, on securing the majority vote of the Executive Committee present at any meeting of that Committee, or majority vote of members present at any regular or special meeting of the Association, and signing the Constitution and By-Laws, paying an entrance fee of two dollars, shall become a member of the Association, and shall remain so as long as he pays all dues and assessments promptly, unless expelled.

SEC. 2.—Whenever the fee shall prove insufficient for the current and necessary expenses of the Association, then the Executive Committee shall cause to be levied on each member a further assessment, the whole to be approved by a majority vote of the members present at any regular or special meeting.

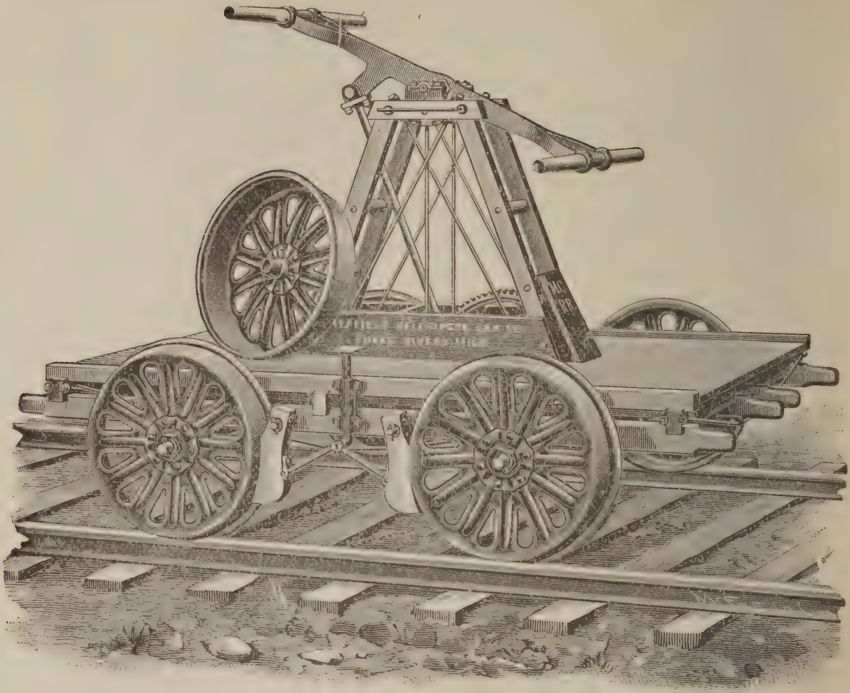
SEC. 3.—Every member of this Association shall be notified by the Secretary at least two weeks before the special meeting of the Association, of his assessments, and if he shall fail to pay the same on or before the next annual meeting, he shall then cease to be a member of this Association, unless his dues are paid or remitted by a vote of members at any regular or special meeting.

SEC. 4.—Any member may be expelled from this Association by a two-thirds vote of the members present at any regular meeting.

SEC. 5.—Any member ceasing to be a roadmaster, or assistant roadmaster, or engineer of maintenance of way, shall at the same time become an honorary member of the Association, and shall enjoy all the privileges of active membership, with the exception of voting and holding office, and the further exception of the right to discuss on the floor, except as called upon by the chairman.

## ARTICLE V.

SECTION 1.—Any portion or the whole of these By-Laws may be amended, or others substituted instead, by a two-thirds vote of all members present at any regular or special meeting of the Association.



IMPROVED STEEL WHEEL HAND CAR.

The Sheffield Car Company were

- The first to offer a three wheeled car ;
- The first to offer a wood center wheel ;
- The first to offer a wood center wheel with steel tire ;
- The first to offer a wood center wheel with steel hub ;
- The first to offer a Hand Car weighing 500 lbs., thoroughly adapted for section use ;
- The first to offer an *all steel wheel ;*
- The first to offer Hand and Velocipede Cars with *gearing cut* from the *solid metal*, and as a matter of fact, this company have been pioneers in all of the valuable improvements in their line of goods.

They were given highest award by the Worlds' Fair for excellence of design and workmanship in Hand and Velocipede Cars, and Stand Pipes.

**SHEFFIELD CAR CO.,**

**THREE RIVERS, MICH.**

Samuel Schoch, Prest. Stephen D. Barnett, Treas. and M'g'r.
John B. Ross, Sec'y and Supt.

THE

# POSITIVE LOCK WASHER CO.

OF AMERICA.

**Patented in United States and Foreign Countries.**

The only Positive Lock Washer—an ideal nut lock for Railroad Track, Frogs, Crossings, Locomotive and Car Frames, Trucks, Bridges and machinery in general.

Its novel mechanical principal may interest you. Heretofore in the designing of nut locks no provision has been made to counteract those forces which destroy its efficiency, viz: *vibration, expansion,* or the “*easement*” occurring from *wear* of the parts to which it may be applied.

*Grip thread bolts and nuts do not provide for expansion, as they possess no power to contract. After the bolt is elongated the result is a loose joint.*

A plain spring washer partially remedies the trouble but from constant compression it soon loses its resiliency and is worthless. The Positive Lock Washer is an oil-tempered spring-steel lock washer, provided with tapering ends, themselves permanent springs, carrying sharp barbs with embed themselves in the face of the nut and in the splice bar or metal next to the washer.

This Washer is *reversible* and can be used many times. Does not injure the nut, its threads or the threads of the bolt.

Exhaustive tests covering a period of nearly four years on railroad track, drop presses, and machinery subject to vibration, have proven its superiority over every nut lock manufactured.

We will gladly furnish samples on application, and are prepared to furnish all sizes from 5-8 inch in diameter to 1 1-2 inches. Special sizes to order.

We respectfully solicit correspondence.

**THE POSITIVE LOCK WASHER CO.,**
**NEWARK N. J.**

# PNEUMATIC RAILWAY GATE!

**The only purely Pneumatic Device for this Purpose.**

Received Highest Awards at the World's Columbian Exposition.

Nothing under ground but small air pipes.

**Gates are locked both up and down.**

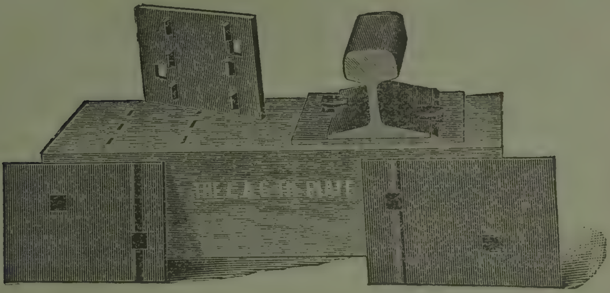
We also manufacture a **Combination Railway Gate** (operated by compressed air, with mechanical connection under the street, or over head, as are all other so-called "Pneumatic Gates," except our Purely Pneumatic Device); the best, most durable, and cheapest of its class in the market.

Partial list of Roads using our Purely Pneumatic Gate:

Alleghany Valley R. R.
Boston & Albany R. R.
Baltimore & Ohio R. R.
Chesapeake & Ohio Ry.
Chicago & Alton R. R.
Chicago & North Western Ry.
Chicago Burlington & Quincy Ry.
Chicago, Great Western Ry.
Chicago, Milwaukee & St. Paul Ry.
Chicago, Rock Island & Pacific Ry.
Chicago, St. Paul, Minn., & Omaha Ry.
Cin , & Muskingum Valley Ry.
Cin., Hamilton & Dayton R. R.
Cleveland & Marietta Ry.
Cleveland, Akron & Columbus Ry.
Cleveland, Canton & Southern R. R.
Cleveland. Cin., Chicago & St. L. Ry.
Cleveland, Lorain & Wheeling Ry.
Delaware & Hudson Canal Co.
Fall Brook Coal Co.
Fitchburg R. R.
Flint & Pere Marquette R. R.
George's Creek & Cumberland R. R.
Grand Rapids & Indiana R. R.
Lehigh Valley R. R.
Long Island R. R.
Louisville, New Albany & Chic. Ry.
Michigan Central R. R.
Milwaukee, Lake Shore & West'n Ry.
Nashville, Chattanooga & St. L. Ry.
N. Y. C. & H. R. R. R.
N. Y., Chicago & St. Louis R. R.
N. Y., Lake Erie & Western R. R.
New York & New England R. R.
N. Y., N. H., & H. R. R.
Northern Pacific R. R.
Pennsylvania R. R.
Pennsylvania Company.
Philadelphia & Reading R. R.
Pittsburgh, Cin., Chic., & St. L. R.R.
Staten Island Rapid Transit R. R.
St. Paul & Duluth R. R.
Southern Pacific Co.
Wisconsin Central Co.

**PNEUMATIC GATE CO.,**
**Wm. P. Elliott, Manager,**
**100 Washington St. CHICAGO.**

# THE C. A. C. TIE
# PROTECTOR PLATE.



## Ye Masters of Road Take Notice

OF

The Practical claims of the C. A. C. Tie Plate.

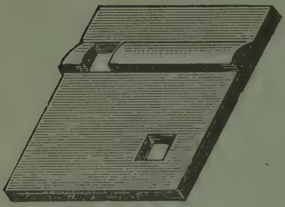
**It prevents the tie from being cut by the rail.**
**It prevents the spike from being cut by the rail.**
**It preserves an absolutely true gauge.**

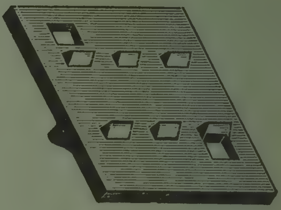
The Plate is being tried and used upon the following well known roads.

Mareitta & N. Ga.
Buf. Rochester & Pittsbg.
Boston & Albany.
Pennsylvania R. R.
Central R. R. of N. J.
Boston Revere Beach & Lynn.
Kansas City Belt Line.
Lehigh Valley.
Chicago & West. Mich.
Long Island R. R.
N. Y. Central & H. R. R. R.
K. C., Ft. Scott & Memphis.
Baltimore & Ohio R. R.
Toledo, St. L. & K. C. R. R.
C. C. C. & St. L. R. R.
L. S. & Mich. Southern.
Cumberland Valley.
Western N. Y. & Penn.
Mich. Central.
Grand Rapids & Md. R. R.

# JUST WHAT TRACKMEN

## MUST HAVE.





## THE C. A. C.

## TIE PLATE.

Manufactured from soft Boiler Steel.

The shoulder on surface of Plate gives bearing surface to flange of rail and prevents cutting of spikes.

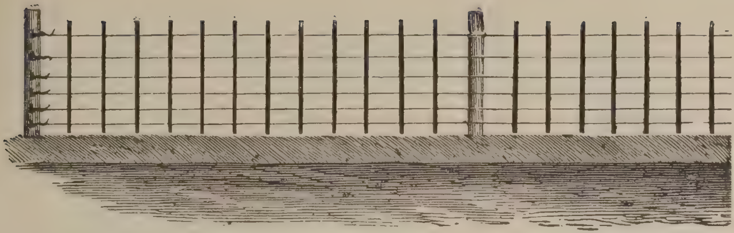
The lugs on under side act as spikes holding the Plate and rail in accurate allignment. Plates for angle bar joints and Check Plates to prevent rail from creeping.

We respectfully solicit you correspondence.

**THE STANDARD R. R. EQUIPMENT CO.**

143 Liberty St.

Central R. R. of N. J. Bldg. NEW YORK.



# BETTS FENCING COMPANY

MANUFACTURERS OF

## Farm and Railroad Fencing.

PALMER, MASS.

---

### Facts relative to our fencing.

---

The Betts Fencing is not only popular with railroads, but is liked by the farmers.

It has no enemies, therefore will not be cut down or destroyed.

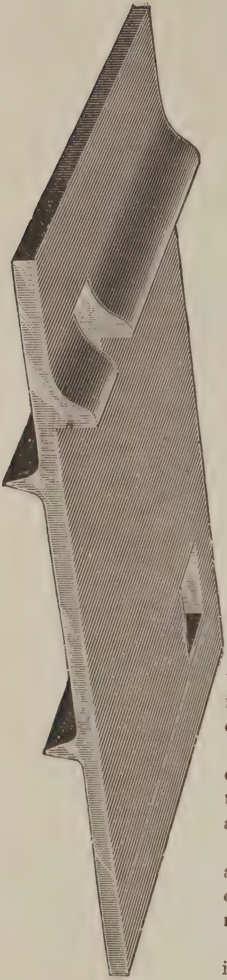
The pickets reach above the top wire, therefore animals will not rub against and bear down upon the fence or, loosen the staples.

Posts may be placed from 12 to 16 ft. apart.

We use six galvanized wires, number $11\frac{1}{4}$, stapled to chestnut or pine pickets, therefore any weight brought to bear upon any part of fencing is distributed equally upon each wire, thus making a very strong fence.

In appearance our fencing will speak for itself.

We roll the sections into bundles of 100 ft. each and furnish couplings with which to connect them.



# DILWORTH, PORTER & CO.,

(LIMITED.)

PITTSBURGH, PENN.

MANUFACTURERS OF THE

# GOLDIE SPIKES

AND

# TIE PLATES.

This plate is rolled by us from the same kind of material as the spike.

It has a rib on the upper side to receive the lateral thrust of the flange of the rail, and thus prevents entirely the wear on the neck of the spike, and its liability to being sheared off ; this is a difficulty that is exceedingly prevalent with all other makes of tie plates.

It has on the under side two ribs, having sharp edges that enter the tie at right angles to its grain, thus giving it the holding power of many spikes against widening of the guage.

Our prices for both Spikes and Tie Plates are always as low as are consistent with the best quality of material, and the highest possible excellence in manufacture.

If you are not using our goods, send for prices and information.

---

## The Goldie Spike has the following advantages:

It is sharp, and has a perfect point.

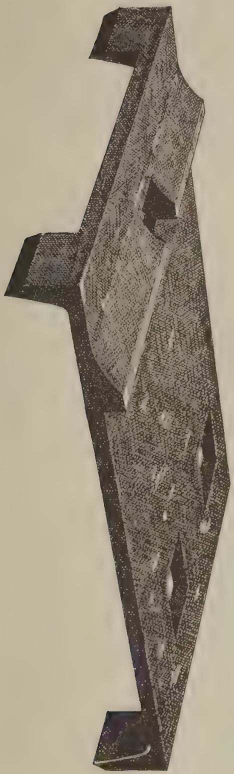
It is reinforced in the neck, giving double wear over other makes.

It has 20% more holding power in oak, and 40% to 100% more in soft wood than the Common Spike.

The head cannot be broken in use on rails, or in the slots of angle bars and braces.

Twenty-five per cent. of all Standard Sized Spikes used this year in the United States have been Goldie Perfect Spikes.

This record within four years speaks for itself.



# DILWORTH, PORTER & CO.,

(LIMITED.)

PITTSBURGH, PENN.

---

# THE GOLDIE

## SAFTY

# TIE PLATE.

This Plate has been in use on many roads during the past year and has given results far exceeding in value those obtained from any other other device of the kind. As a joint plate and for use on curves to prevent canting of the rail or spreading of gauge it cannot be excelled.

It can be, when applied, driven to its place on the tie rail spiked and roadway surfaced up at once without depending on the trains to put it down.

It adheres to the tie with very great power becoming practically a part of the tie, thus preventing all mechanical abrasion of the wood and all tendency to rattle or buckle.

It takes all lateral strain off the spikes, prevents their necks being cut by flange of the rail and thus allows them to be confined to their proper function of preventing any vertical movement of the rail.

The combination of these Plates with the Goldie Perfect Spike is the most perfect, safest and convenient combination that has yet been produced for the economical maintenance of way.

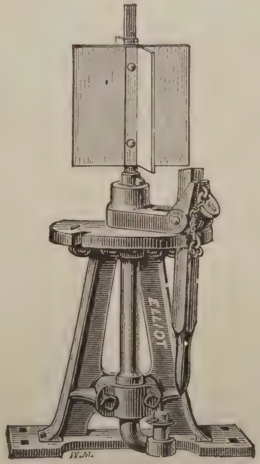
We manufacture all our goods of the very best material and of the highest attainable workmanship and furnish them at the lowest price consistent with the quality of the goods.

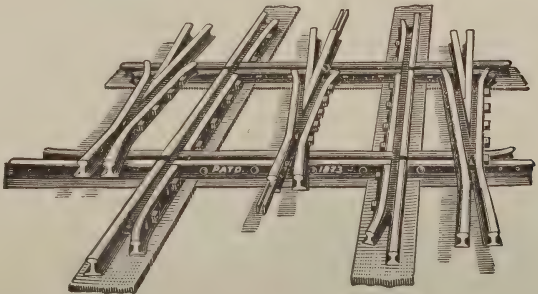
Send to us for prices and information.

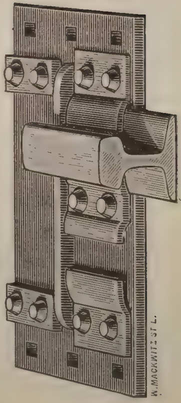
# ELLIOT FROG & SWITCH CO.,

—— MANUFACTURERS OF ——

Split Switches, Spring Rail Frogs, Lap Switches, Rigid Frogs with Solid (Welded) Filling, Bridle Rods, Wrought Iron Head Chairs, Rail Braces, Replacing Frogs, High and Low Revolving Switch Stands for Main Line or in Yards, Automatic Switch Stands.






W. MACKWITZ ST L.

Catalogue and Estimates on application.

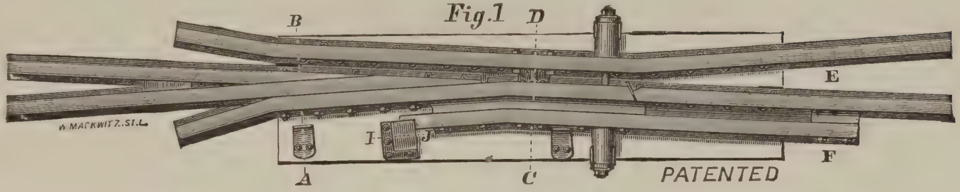
**EAST ST. LOUIS, ILLINOIS.**

# ELLIOT FROG & SWITCH CO.,

## EAST ST. LOUIS, ILLINOIS.

---

THE "EUREKA" SPRING RAIL FROG.



We manufacture Spring Rail Frogs of almost every improved design. The cut above illustrates the "Eureka" Spring Frog, the latest improvement we have made. We consider it equal as safe as an open Stiff Rail Frog with durability equal to any Spring Frog. It requires no extra attention after being properly placed in track as only two feet of the Main Line is movable and these parts cannot be effected by Expansion or Running of rail. A large number are now in use.

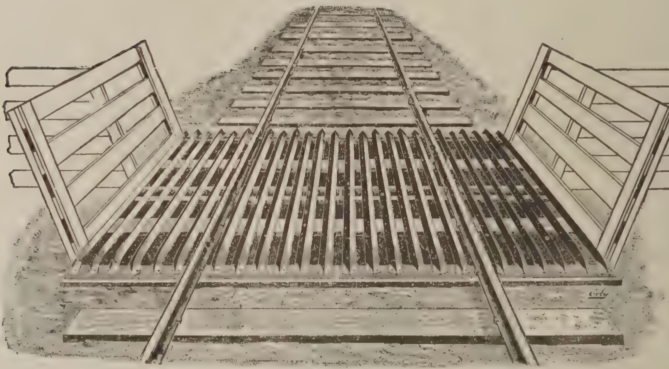
Blue Print and Estimates on application.

THE

NATIONAL SURFACE GUARD CO.,

Rookery Building,

CHICAGO, ILL.



(New No. 5.)

Weight, 400 lbs ; width, 10 feet ; length, with rail, 8 feet 8
inches ; opening between slats, 2 inches ; difference
in heights of slats, 1½ inches;
slats made of (No. 9
gauge) steel
angles.

**30,000 National Guards now in track, in this, and foreign countries.**

JOHN S. LANE & SON,

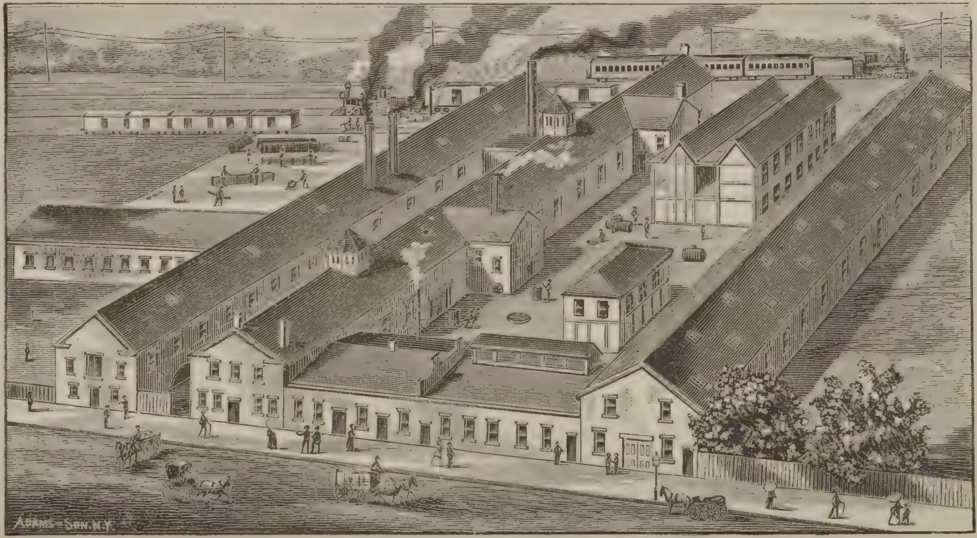
CONTRACTORS, - - - MERIDEN, CONN.

BROKEN STONE FOR RAIL ROAD BALLAST, MACADAMIZING, &c.

R. F. HAWKINS, Proprietor. C. H. MULLIGAN, Supt. E. B. JENNINGS, Engineer.

R. F. HAWKIN'S IRON WORKS.

STEAM BOILERS,
Iron Castings, Bolts &c.


ADAMS—SON, N.Y.

IRON AND WOODEN
Bridges and Turn Tables.

SPRINGFIELD, MASS.

# VERONA TOOL WORKS.

OFFICE.
Pittsburg Pa,
The Telephone Building.

WESTERN DEPOT.
64 & 66 So. Clinton St.,
Chicago, Ill.

FACTORY.
Verona Station A. V. Ry.

We were the first—and believe still the only—concern to make a *Specialty* of

## SOLID STEEL RAILROAD TRACK TOOLS.

All of our Tools are made of selected, solid, cast steel—each, and every Tool is thoroughly tested before leaving the Factory : our patented Trade Mark is stamped on every article, and, when so stamped, are guaranteed to be the best in the market. We do not manufacture any cheap, or iron, Tools.

*We were the first to introduce the patented, Coiled Spring Nut Lock*, known the world over as

## THE PATENT VERONA NUT LOCK:

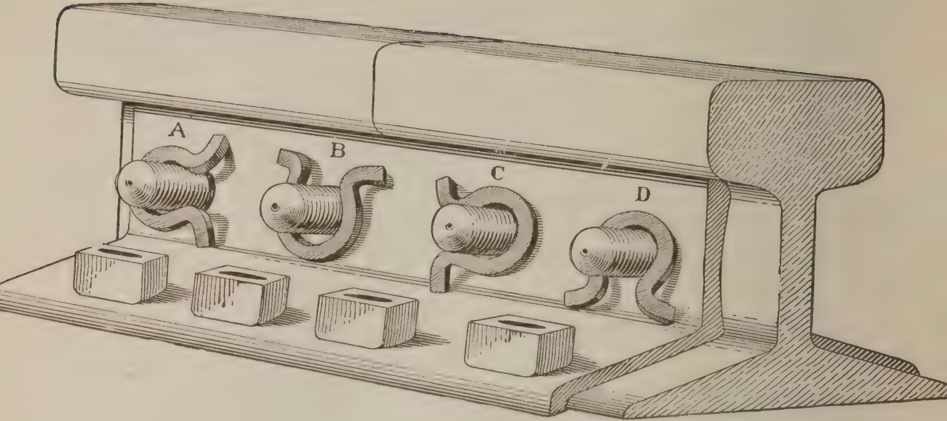
*there are 210,000,000* now in use, the figures, and our reputation, leave nothing further necessary to be said.

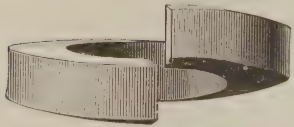
Our catalogue gives cuts of 88 of our specialties, but we will make to any pattern, or sketch, sent to us.

Our "*book of blue prints*"—*copyrighted*—is the most useful, so say all Railroad men, publication that has been issued.

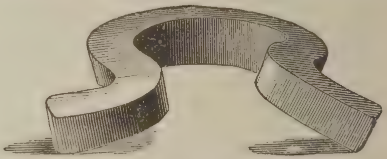
We will be pleased to send our catalogue, "Book of Blue Prints" or "Useful Information", upon receipt of request, and address : and to answer any inquiries.

Trade Mark.





*No. 1 Plain Square Nut Lock.*



*3-4 Standard Nut Lock.*

---

## DISTINCTIVE MERITS OF THE

# "STANDARD" NUT LOCK

Fixedness of Position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of Angle bar.

Unlike any permanently placed, double washer, the Standard is interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position, it offers double the locking friction of nut locks, which when in their DEAD "set" condition turn back with nut by the vibrative effect of passing train.

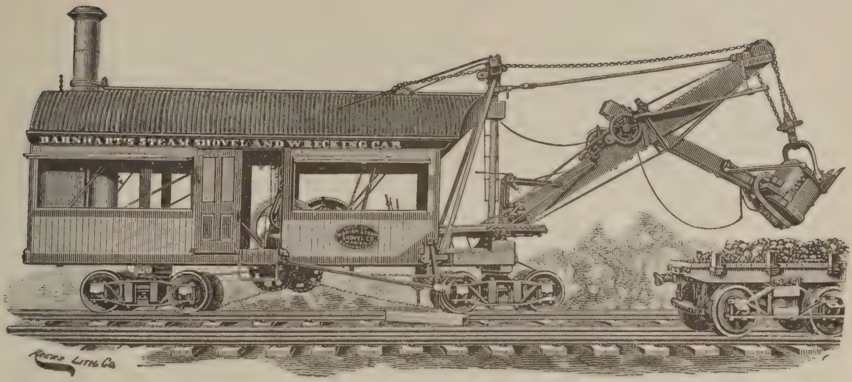
The "Standard" Nut Lock embodies the old principal of spring power improved by overcoming the objection to the double washer or lock nut, and covering the weak points of the single coil washer.

The new cold process oil-hardened and drawn-temper "Standard Nut Lock" is the most powerful Compensating Spring ever made for "taking up" wear and restoring bearings of Angle-bar under head of rail in railroad track. Accumulation of rust, oil, sand, and dust, is all the positive Nut Lock required to Lock the Nut to the Bolt.

**NOTICE**—Spring Nut Locks should never be set up dead. Leave 25 per cent. of the original "set" for accomodating spring to expansion and contraction.

**STANDARD NUT LOCK CO.,**

236-248 Bank St., NEWARK, N. J.


BARNHART'S STEAM SHOVEL AND WRECKING CAR
MARION STEAM SHOVEL CO.
Krebs Litho Co

**Barnhart's Steam Shovel, Style A.**

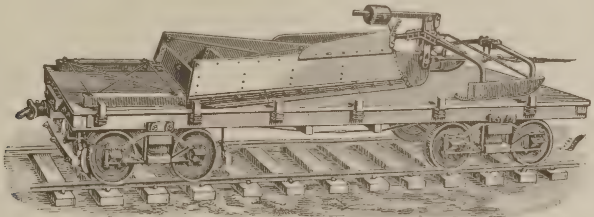
# The Marion Steam Shovel Co.

## OF MARION, OHIO,

Manufacturers of Steam Shovels of various capacities, suitable for all classes of work. Ballast Unloaders, both center and side; Railroad Ditchers, and a full line of Dredges.

We are pleased to announce our success at the World's Columbian Exposition, we having received the highest testimonials. Our award reads: "Marion Steam Shovel Co., Steam Shovel and Dredge Machinery. First, for general excellence of design of Barnhart Steam Shovel, giving wide working range, with simplicity of parts; also for excellence of design, and workmanship of Dredge Machinery Second, Ballast Unloader; excellence of design, enabling ordinary flat cars to be used efficiently in construction service with small expense. No permanent fixtures on cars being necessary."

The above is the exact wording of our diploma. We invite interested parties to send for our Illustrated Catalogue. We can make it an object for you both in machine and price.

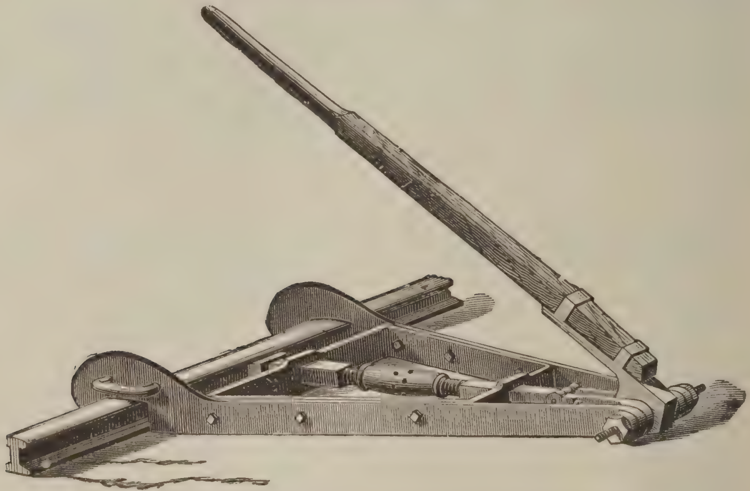


**Barnhart's Ballast Unloader.**

# THE EMERSON

# Rail-Bending and Straightening Machine

**Made of best Wrought Iron and Wrought Steel.**
**Interchangeable Parts always in Stock.**



IMMEDIATE SHIPMENTS.

## SIZES:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. 2— | Guaranteed | to bend | rails | 45 to 65 | lbs. | to the | yard. |
| No. 3— | " | " | " | 65 to 90 | " | " | " |
| Special No. 4— | " | " | " | 90 to 115 | " | " | " |

*The Special No. 4 Machines are now in use on the New York, New Haven and Hartford Railroad, bending and straightening their 100 pound rails.*

---

These Machines are in use on the principal steam and street railways in the United States and other countries. Highest testimonials furnished. For further information, address

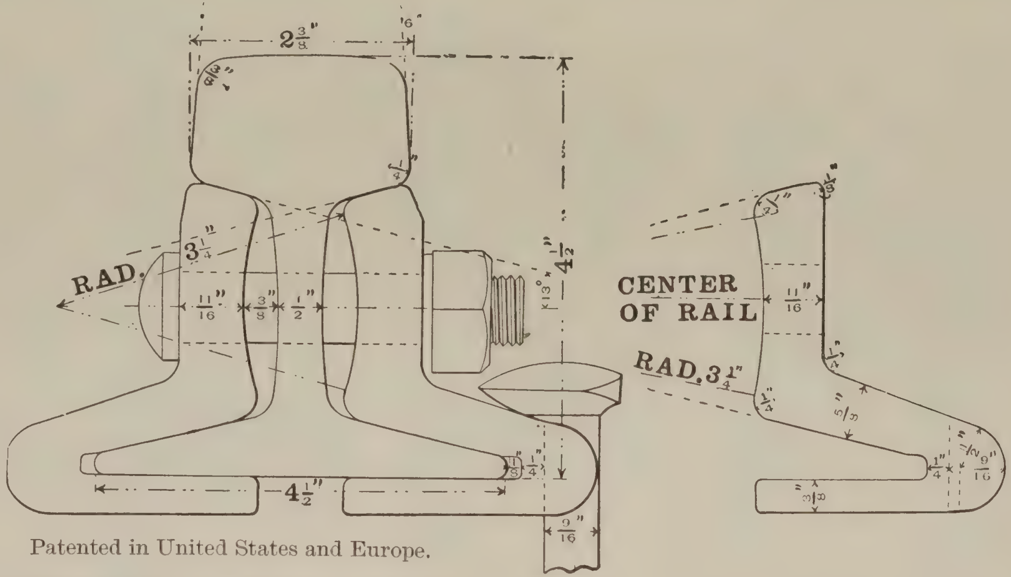
**M. H. BROWN,**

**115 Broadway, Room 29, . . NEW YORK.**

# The Coming Joint For Steam Railroads, Electric and Cable St. Railways.

Rapidly taking the place of Angle Bars.

In successful use on fifty-six Roads.



Patented in United States and Europe.

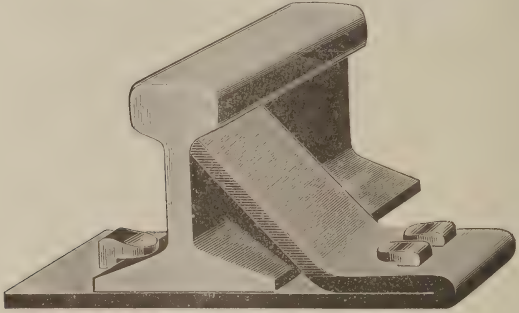
The use of this Joint will save 50 per cent. of the cost of maintenance of way, add 25 per cent. to the life of the rail and incidentally effect a saving of wear and tear on wheels and rolling stock.

**Continuous Rail Joint Co of America,**

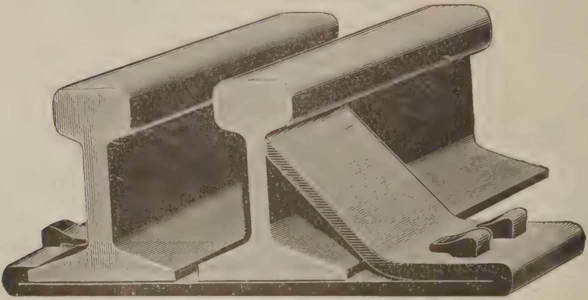
182 Market Street,
NEWARK. N. J.

# THE EDWARDS' RAIL BRACE!

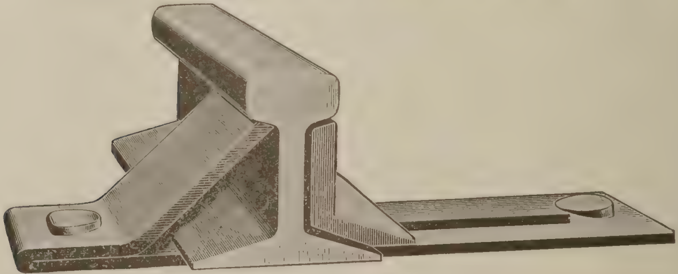
Patented Dec. 17, 1889.



COMBINED TIE PLATE AND BRACE FOR CURVES.



GUARD RAIL BRACE.



COMBINED SIDE PLATE AND RAIL BRACE FOR SPLIT SWITCH.—SWITCH CLOSED.

*MANUFACTURED BY THE*

## PAIGE IRON WORKS,

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**Frogs, Switches and Crossings, Switch Stands,**
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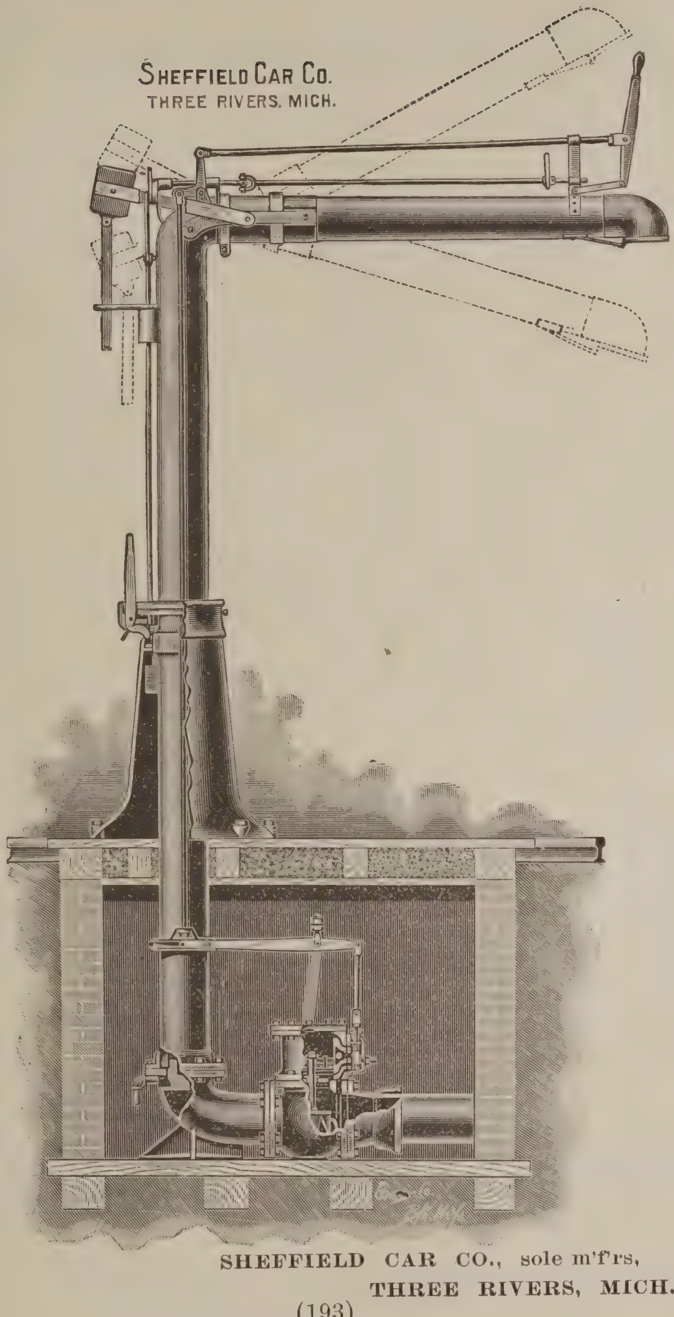
**Head Chairs.**

Improved central bearing automatic Railway Stand Pipe.



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THREE RIVERS, MICH.

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**Hand Cars and Push Cars with pressed steel wheels.**
**Bridge Gang Cars, Tracklayers' Cars, Insp'n Cars,**
**Railway Velocipedes for one, two and three men,**
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**Track Gauges, Levels, Cattle Guards,**
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**Track Chisels and Punches, Rail Tongs, Rail Forks,**
**Claw Bars, Pinch Bars, Lining Bars, Car Movers,**
**Railroad Clay Picks, Tamping Picks, Shovels,**
**Wheelbarrows, R. R. Dump Cars, Dump Carts,**
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## Fairbanks, Morse & Company,

*Lake and LaSalle Sts., CHICAGO, ILL.*

# PETTIBONE, MULLIKEN & CO. MANUFACTURERS, CHICAGO, ILL.

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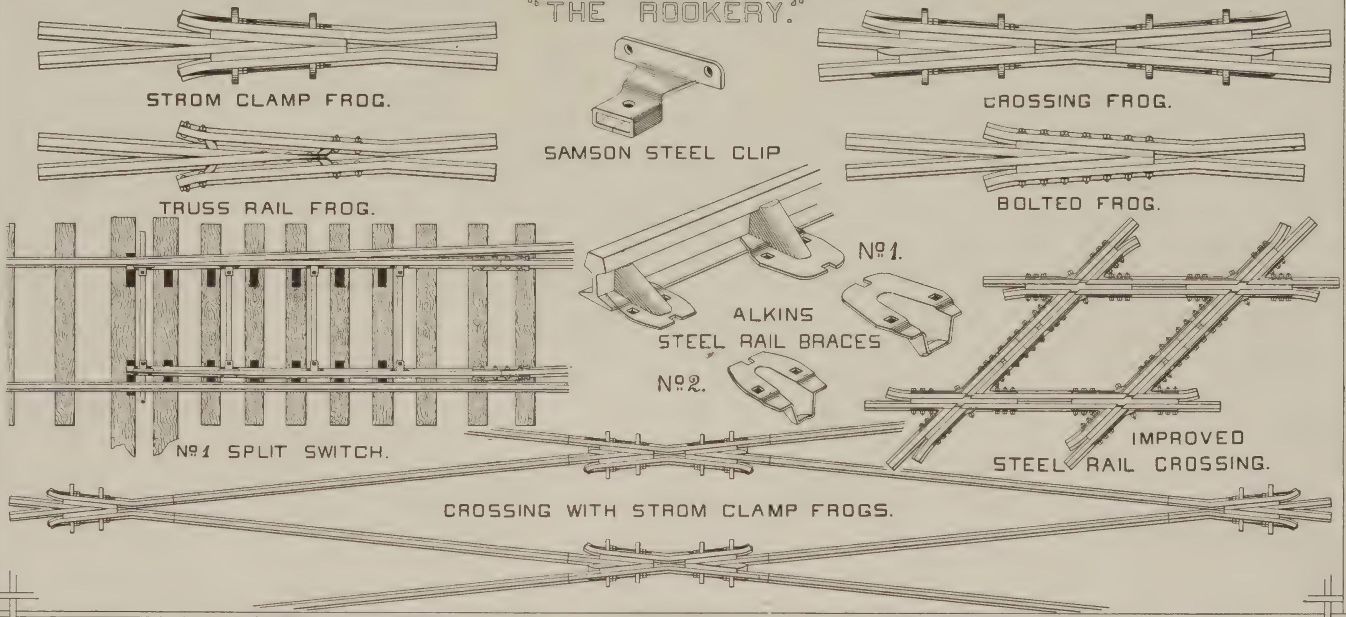

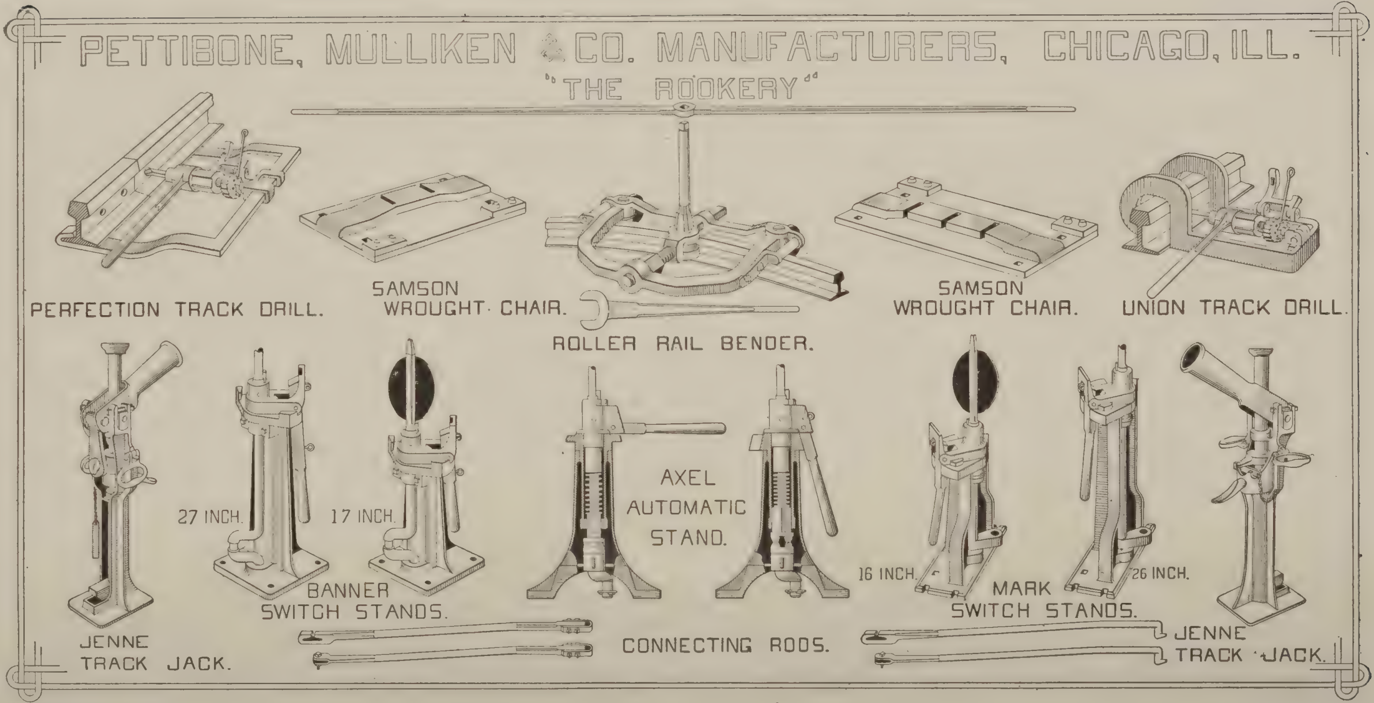
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# JOYCE, CRIDLAND & CO., Dayton, Ohio,

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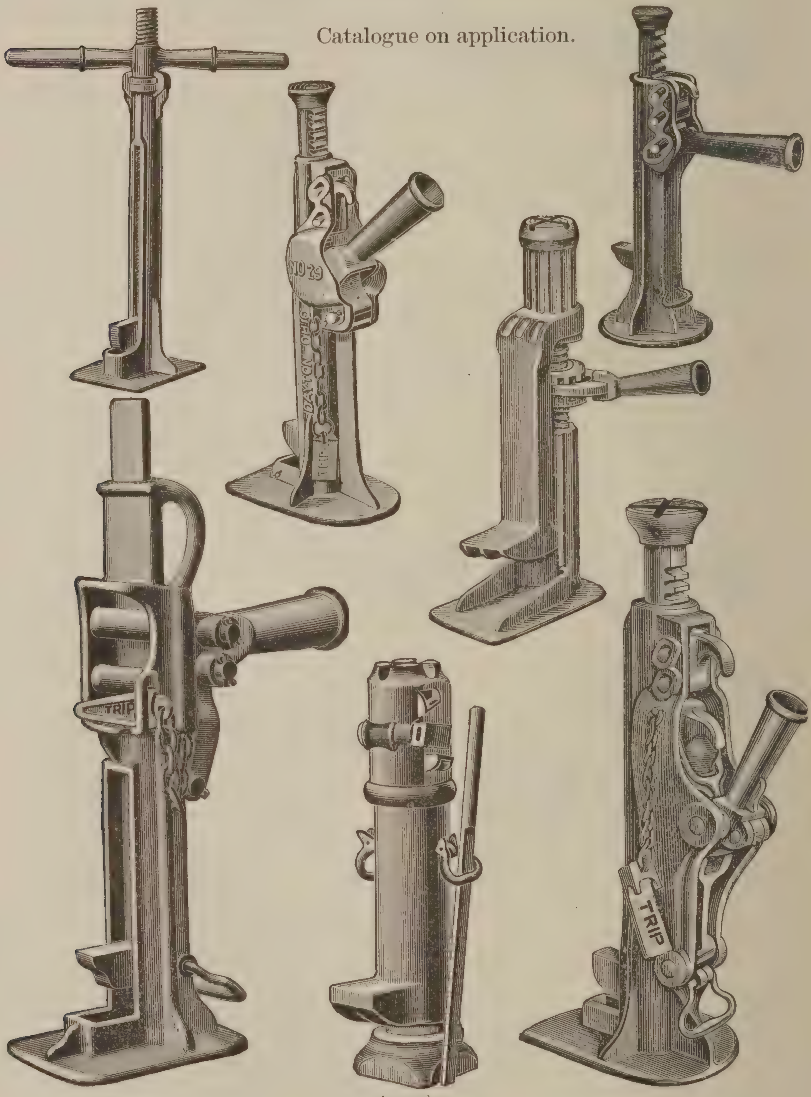
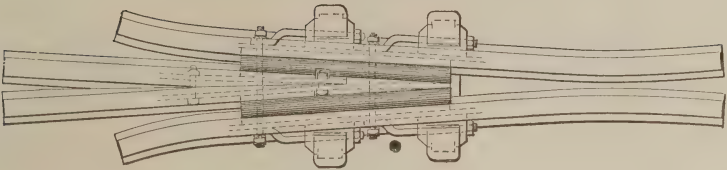
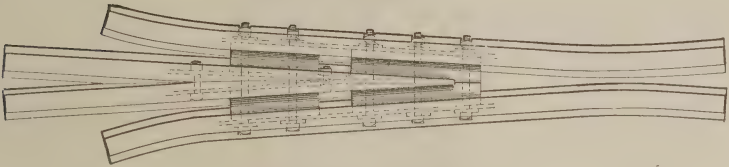


# FROGS.



YOKED FROG.



BOLTED FROG.

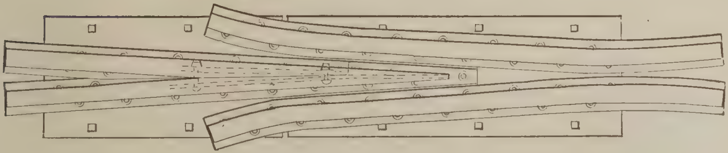
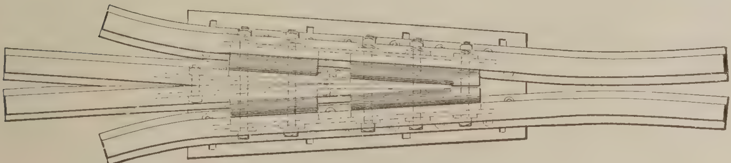


PLATE FROG.



BOLTED PLATE FROG.

## RAMAPO IRON WORKS,

**HILLBURN, ROCKLAND CO., N. Y.**

# RAMAPO IRON WORKS.

### ONE OF ITS SPECIALTIES:

## Flange Brake Shoes.

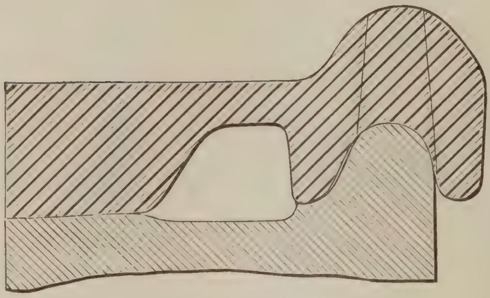


*Fig. A.*

POSITION OF ROSS SHOE WHEN APPLIED TO WHEEL OPPOSITE SHARP FLANGE.

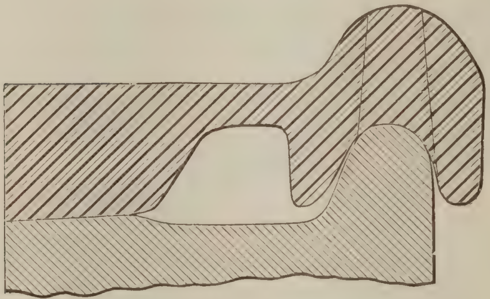


*Fig. B.*

POSITION OF ROSS SHOE APPLIED TO WHEEL WITH SHARP FLANGE.

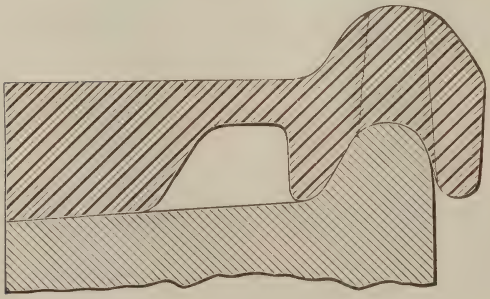


*Fig. C.*

HOW ROSS SHOE FITS WHEN BOTH WHEEL AND SHOE ARE NEW.

*HERE ARE SOME OF THE REASONS WHY THE*

# Ross Brake Shoe

*PREVENTS FLANGE WEAR:*

It is a well-known fact that the trucks of a new care are generally rigid on account of extra friction on the center-plates, journals, and other causes, thus forcing one of the flanges of the wheels against the rail until the opposite wheel has worn a slight groove in the tread, like shown in figure A ; this causes a continuous rolling of the wheel in the groove first formed. Notwithstanding the truck may have become perfectly free by its frequent changes on the curves, the wheel will still roll in the same position.

The application of the Ross Shoe as shown in Figure A, will very soon wear away the raised part and second flange, and thus permit the free oscillation of the wheels on the track.

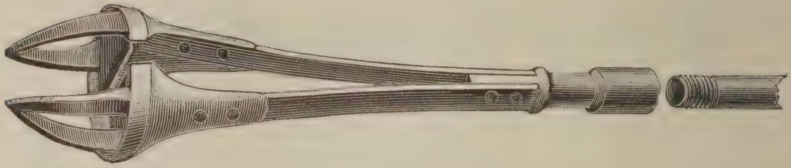
It will be seen by the diagrams herewith, that the shoe on the sharp flange wheel will not touch that part of the flange already worn until it assumes its original shape, thus keeping both flanges and tread in good condition, thus saving frogs and switches, as well as the rolling stock.

D. B. RUFFNER. D. B. RUFFNER, JR.

# RUFFNER & SON,

MANUFACTURERS OF THE

## EXCELSIOR



# STEEL TUBE CLEANERS

## Norristown Railroad and Bowman Street,

(SCHUYLKILL FALLS,)
PHILADELPHIA, PA.

---

We beg leave to call the attention of the public to our valuable invention for the cleaning of Boiler Tubes. We claim that it is the most EFFECTIVE and DURABLE, and consequently the CHEAPEST Tool in the market,—having been tried with entire satisfaction by many of our practical Engineers.

We do not deem it necessary to discuss the matter of Scale and what causes it, Engineers understand that, and also, the evil of allowing it to remain in the Tubes. Having had thirty-eight years mechanical practice, we claim to have some knowledge of the tool required to clean Tubes.

First.—The Tool should scrape off the dirt and drive it out as it scrapes it off.

Second.—It should sharpen itself while in use.

Third.—They should clean hot or cold Tubes in both Marine and Stationary Boilers, and be sufficiently strong for all emergencies. All these requiements we claim, and hence the excellence of our Tool.

THE EXCELSIOR TUBE CLEANER is manufactured of Cast Steel, Hardened and Tempered in such a manner as to stand such friction and wear as may be brought upon it, its two sections being kept upon the surface of the Tube by properly hardened and tempered adjusted springs, and the one section overlapping the other (as seen in the cut), prevents the loosened Scale from passing back of the Cleaner.

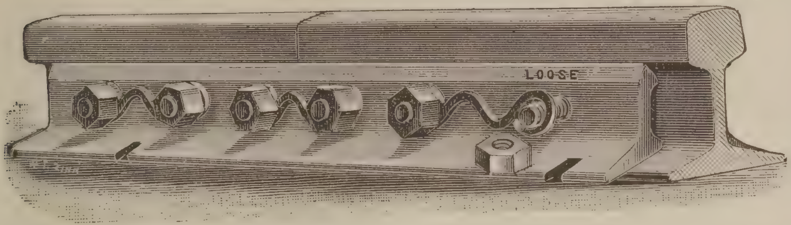
These Cleaners are also adapted for cleaning Vertical Boilers from either top or bottom ; from the bottom by removing the grate bars, as the Tool leaves the Scale drop to the bottom as it is scraped from the Tube ; the overlapping circle being dispensed with for Vertical Tools.

---

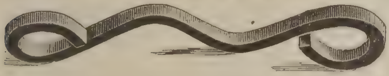
**Price, $1.00 per Inch, outside measurement of Tubes.**

EXCELSIOR SINGLE AND DOUBLE

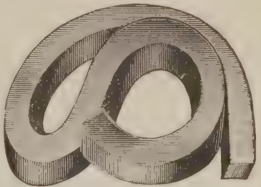
# Automatic Nut Locks or Fish Plate Springs.



It is well understood in mechanical practice, that where a combination of iron plates are "screwed together with bolts and nuts, and subjected to jar, that said nuts, bolts and plates will become loose." And in no place does it appear to give more trouble than on railroad tracks, where the joints are so numerous and the jar is so heavy, by trains running over them, which causes friction, and the nuts, bolts and fish plates become loose and rattle. We find in our EXCELSIOR AUTOMATIC NUT LOCKS, OR FISH PLATE SPRINGS a positive remedy.



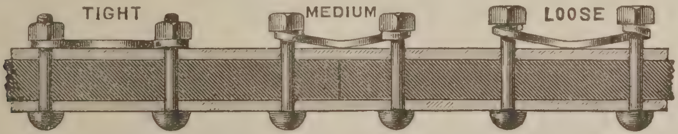
*Double Nut Lock.*



*Single Nut Lock.*

Place the springs as shown in cut, with eyes bearing outward against the nuts, and screw them up the usual way, by which the springs are compressed against the fish plate, the two ends of the springs becoming levers pressing against the nuts ; the springs now become permanent automatic levers, pressing heavy between the nuts and the fish plates.

By this invention the loosening of the nuts, bolts and plates is prevented, and the joint is as solid as any part of the rail. They cannot rotate with the nuts, and are not easily lost or mislaid. They make a permanent, fast joint, and saves the labor of track-men screwing up nuts.



The single Nut Locks can be used on bolts for switches, as well as rail joints, and all places where distances are irregular between bolts.

They are patented in the United States, Canada, England, France, Germany and Belgium ; and we claim that they are cheaper, more durable and effective, and, being hardened and tempered, always retain their life and elasticity. And we challenge all competitors for their equal in effectiveness and durability

*These Nut Locks have been adopted by the New England Road-masters* (*in Conventions*) *as the best Nut Locks known.*

In placing the double spring on the bolts the center of spring should bear on the fish plates, and screw them up the usual way.

Sample lots furnished for trial, *free of expense*, by forwarding the distance between centers of fish plate bolts.

Correspondence and orders solicited.

**RUFFNER & SON,**
MANUFACTURERS,
Schuylkill Falls, PHILADELPHIA, PA.

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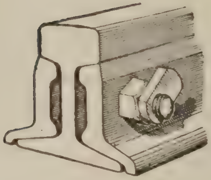

**The Young Patent Nut Lock.**

*THE YOUNG NUT LOCK CO.,*

**150 Broadway, Room 31,**

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WORLD'S COLUMBIAN EXPOSITION.
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FOR GENERAL EXCELLENCE OF DESIGN
AND GOOD WORKMANSHIP.

Also received the high honor of a special recognition by the leading Mechanical Journal of the Old World, "Engineering," published in London. In the Oct. 27th issue the Cyrus Roberts Car was made the special subject of an illustrated leader, showing the wheel and car in detail, as embodying the highest skill and most advanced type of the art.

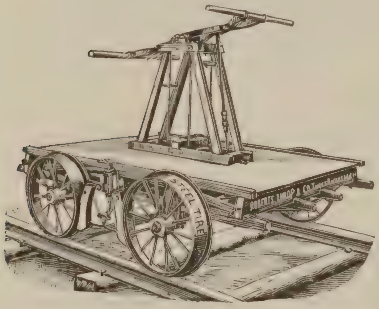
# The Cyrus Roberts Hand Car Specialties,

*ROBERTS, THROP & CO., Three Rivers, Mich.*

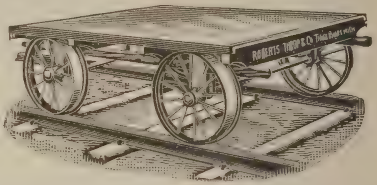
THE

CYRUS ROBERTS IMPROVED

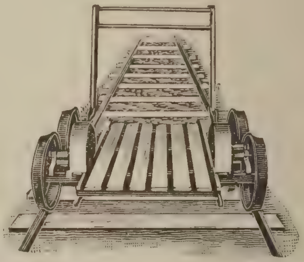
*Standard ✢ Hand ✢ Car.*


STEEL TIRE
ROBERTS, THROP & CO. THREE RIVERS

With Detachable Walking Beam and Gallows Frame, making it a Combination Hand and Push Car: or furnished with Fixed Gallows Frame if so desired.


ROBERTS, THROP & CO. THREE RIVERS, MICH.

**THE CYRUS ROBERTS**
**Improved Push Car.**
***Weight, 425 lbs.***



The "Quick Service" 4-wheel
*LIGHT HAND CAR.*
***Weight, 205 lbs.***

**The Cyrus Roberts Light Hand Car Wheel Embodies all the Needed Requirements. Send for Illustrated Circular giving Official Tests.**

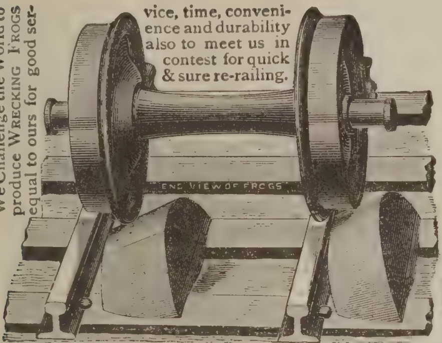
# B. E. TILDEN CO.

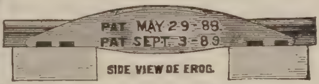
**CHICAGO, ILL.,**

## RAILWAY CAR AND LOCOMOTIVE

# Re-placing Frogs and Bridge Guards,

We Challenge the World to produce Wrecking Frogs equal to ours for good service, time, convenience and durability also to meet us in contest for quick & sure re-railing.





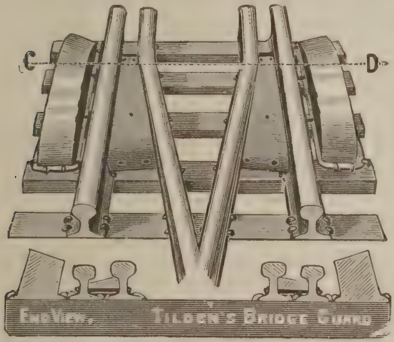
The Tilden Improved Wrecking Frogs for all Railroads, the only strictly reliable invention in use for replacing any derailed rolling stock.

These Extra Improved Replacing Frogs are adapted to any Rolling Stock, and all T rails. Price, in lots of five sets or more, only $20.00 per set.

All goods delivered free by freight to any Ry. in United States not west of Missouri River. To points west thereof we prepay freight free to Missouri River.

Weight of extra improved sizes, about 180 pounds per pair. Correspondence and personal interviews solicited.

***THE RE-PLACERS FOR RERAILING ANY ROLLING STOCK*** —They will convince any practical railroad man of their superiority over all other re-placing devices. They will repay for themselves in saving of time over the use of any other Replacers or Wrecking Frogs, as they will replace any cars or locomotive in about one-fourth the time consumed by other Replacers. They will retain themselves where dropped, and save time and expense in any case of derailment. They are in use on several hundred of the principal railroads and giving perfect satisfaction.


C
D
End View, Tilden's Bridge Guard

BRIDGE GUARDS, with attachments, $100.00 per set. Street Car Replacers and Hose Bridge, $8.00.

These Bridge Guards are the best possible protection to any bridge or trestle. They are similar to the Standard size Wrecking Frogs, but longer. They are placed outside of each rail, and opposite each other. They are positive in replacing any derailed rolling stock, and at the same time are placed at a sufficient distance from the rails to allow all rolling stock to pass upon the rails free of the guards. By using the Wrecking Frog size you will be convinced that the Bridge Guards will replace any derailed rolling stock at any speed. Blue prints and complete description furnished on application.

**To be convinced as to the reliability of Bridge Guards, use our Wrecking Frog size.**

---

☞ *We Challenge the World to produce Wrecking Frogs equal to ours for good service, time, convenience, and durability, also to meet us in contest for quick and sure re-railing, open to all.*

*We received all the Premium Awards on Replacing Frogs, at the World's Columbian Exposition.*

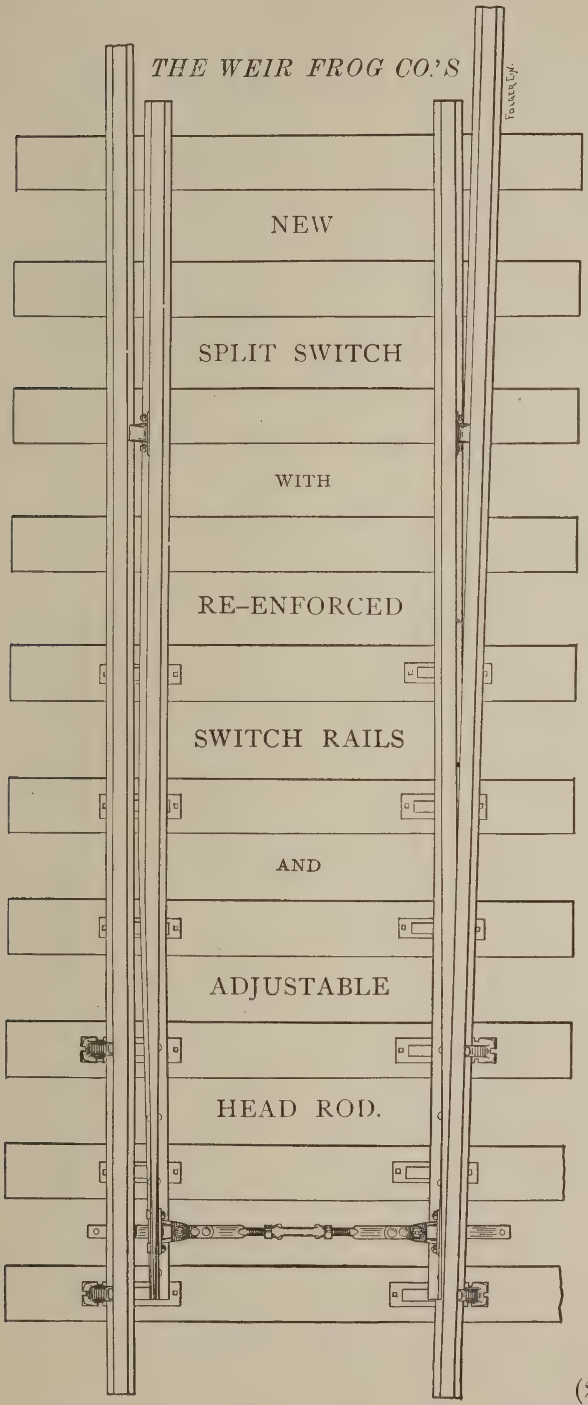
# THE WEIR FROG CO.

We desire to call the attention of Roadmasters to the devices we illustrate on the following pages, and showing improvements which we are certain will be appreciated by them.

On the opposite page, we illustrate by plan and section, our new Split Switch with Reenforced Switch Rails and Adjustable Head Rod. This is our latest design, and one that is very much liked by those who have used it. It will be noticed by section, that we reenforce each Switch rail by a piece of wrought iron riveted to each side of Switch point, and which extends back to the angle bars. This strengthens the Switch rail, and lessens the liability of fracture, and if the rail does break, this reenforcing holds the parts together until the rail can be replaced.

We use only a single bar to this Switch, and this bar is made adjustable by means of a Turnbuckle, and both threads of this Turnbuckle are right hand. On this account it is necessary, when any adjustment of the Bars are required, owing to the points not closing tight up against stock rails, due to wear of parts or other causes, to disconnect the Switch Stand connecting rod, remove the bolts from either of the fastenings to which the rod is bolted, slip rod aside, and then turn to give the proper adjustment needed.

While this is readily done by Trackmen, to maliciously inclined, or meddlesome persons, it will prove delaysome and troublesome, and deter them from interfering with the Switch. The lugs which connect the Switch rails to the head rod are bolted to the web of the rail and the ends of the bolts are riveted over the nuts, so that any adjustment necessary must be made by means of the Turnbuckles. Midway between the heel of the Switch where the heads of the rail diverge, we place a cast stop lug, which is bolted to the Switch rail, and bears against the stock rail. This prevents any buckling of the Switch rail, or any springing at the points.



*THE WEIR FROG CO.'S*

NEW

SPLIT SWITCH

WITH

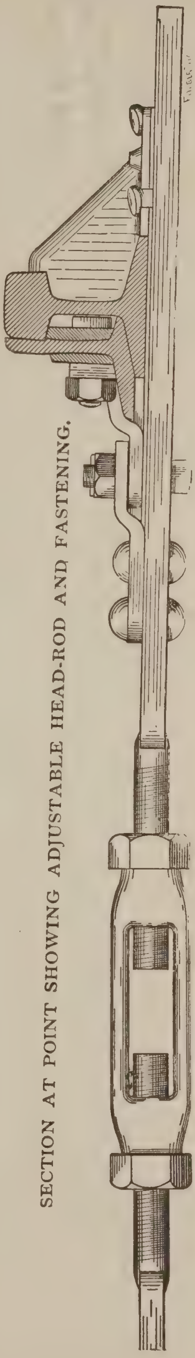
RE-ENFORCED

SWITCH RAILS

AND

ADJUSTABLE

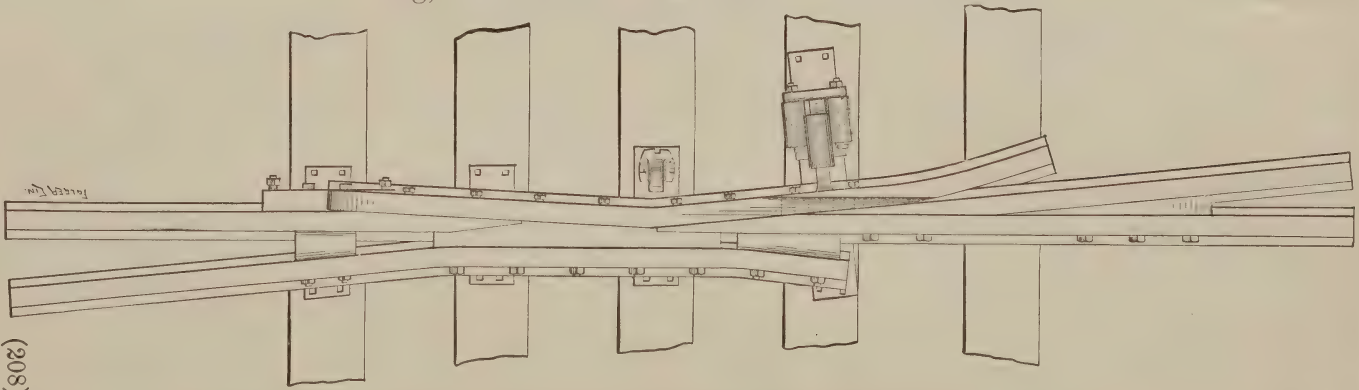
HEAD ROD.



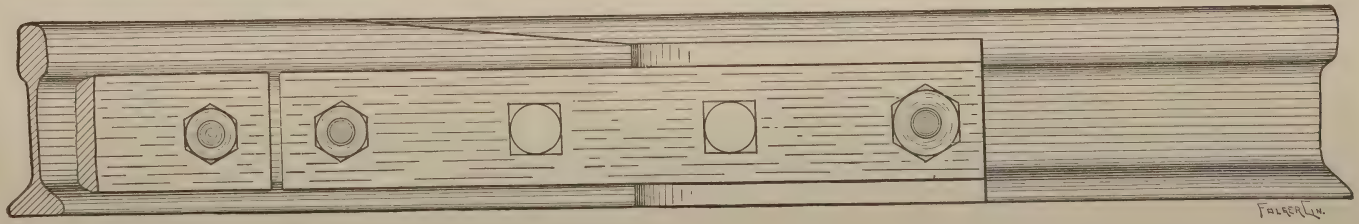
SECTION AT POINT SHOWING ADJUSTABLE HEAD-ROD AND FASTENING.

NEW SPRING FROG.

Increased safety secured by taking spring wing out of main track, becoming the equivalent of a rigid frog, should movable rail break or be displaced.



ELEVATION OF MOVABLE WING CONNECTION.



On the preceding page we show our latest, and we are sure, the best design of Spring rail Frog manufactured.

In this Frog we eliminate a number of annoyances and dangers heretofore connected in this device, and we are certain Engineers and Roadmasters will so decide after a study of the cut, and explanations.

The chief source of annoyance and danger in use of Spring Frogs, is the creep of the main track rails, and when this occurs, the movable wing rail of the Frog is forced out of its proper place, causing the holding down arms to bind to such an extent, that the Springs are seldom powerful enough to overcome the unusual friction, and bring the movable rail back tight against the point, after it has been opened by the train.

In our Frog, as will be noticed, the movable wing rail is joined by a flexible connection to a rigid rail which is a part of the Frog, being bolted to the filling, and to the fixed wing on opposite side, and is also spiked to the Ties. By this arrangement, the creep of the track cannot effect the movable wing, no binding can take place, and the movable wing rail is always able to perform its proper function.

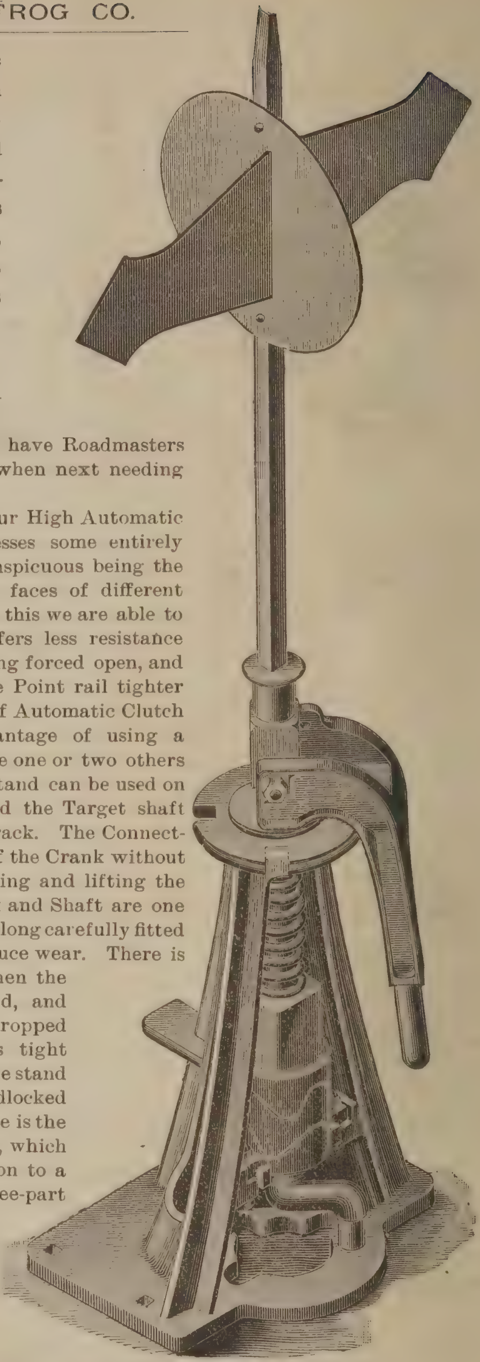
Should any displacement or breakage of movable wing rail take place, the wheels will pass over this Frog without derailment, because they will run on the fixed rail until they meet the filling steel, where they ride upon their flange over the break to the main track rail. Neither can a wheel drop into the throat of this Frog on account of the filling extending until it meets the rigid rails of Frog.

The planing of the head of the movable wing rail back of the point as shown on cut, prevents the outside flange of a worn tread from opening the wing rail, in fact the planing is such that the wheel tends to crowd the wing rail closer to the point.

**The use of Automatic Stands in connection with split switches having been recommended at the Atlanta Convention of the Roadmasters Association of America, we illustrate here what we manufacture in this line.**

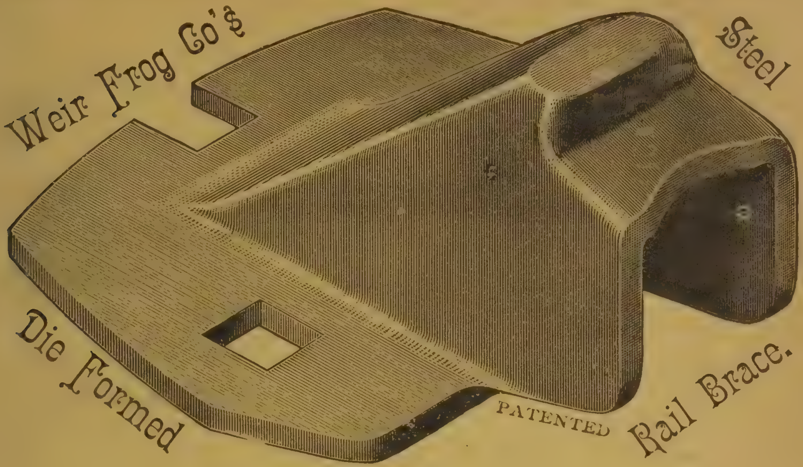
These Stands have proven their reliability on numerous roads now using them, and we would be glad to have Roadmasters make a trial of our Stand when next needing such a device.

The cut herewith shows our High Automatic Switch Stand which possesses some entirely new features, the most conspicuous being the Three-part Clutch, having faces of different inclinations. By the use of this we are able to furnish a Stand which offers less resistance when the switch rail is being forced open, and at the same time closes the Point rail tighter than with any other form of Automatic Clutch Stand. Besides the advantage of using a Three-part Clutch, there are one or two others worth mentioning. The Stand can be used on either one or two ties, and the Target shaft can be turned to suit the Track. The Connecting Rod cannot be taken off the Crank without unbolting the bottom bearing and lifting the crank shaft, and the Crank and Shaft are one piece of Wrought Iron with long carefully fitted bearings and joints, to reduce wear. There is no strain on the Spring when the Switch is thrown by hand, and the Handle cannot be dropped unless the Switch Rail is tight against the Stock Rail. The stand is Automatic whether padlocked or not. Another advantage is the large diameter of Clutches, which reduces possible lost motion to a minimum, and the Three-part Clutch insures a double life to this part of the mechanism and Stand.



AUTOMATIC HIGH STAND.

THE WEIR FROG CO.



We show by above cut, one of six designs of Steel Die Formed Rail Braces which we manufacture. The are made of Homogeneous Steel Plate, one-fourth to five-sixteenths inch thick as preferred, and are die formed to fit any section of rail.

These Braces are practically indestructible, and are a great saving over cast Braces owing to this fact.

We make mention here of some of the large Railroad systems using our Braces, and their adoption by such roads is good proof of their merit.

Among those using, are the

Pennsylvania Co.
Illinois Central.
Atchison, Topeka & Santa Fe.
Pittsburg, C. C. & St. L.
Great Northern.
Boston & Maine.
Long Island.
Central Vermont.
Chicago & North Western.
Louisville & Nashville.
Chicago, Rock Island & Pacific.
Union Pacific.
Northern Pacific.
Concord & Montreal.
Richmond & Danville.
Queen & Crescent.

We have sold over Two Million of our Braces since their recent introduction, and have a capacity of 24.000 per day.

**THE WEIR FROG COMPANY,**

**Works: Front, Smith and Water Sts. CINCINNATI, O.**

# The National Lock Washer.

The only **POSITIVE** Nut Lock combined with spring power.

**EIGHTY-FIVE MILLION** have been used in Rail Road track alone.

It is made the **BEST,** wears the **BEST,** and gives **BETTER** service than any other nut lock made.

It is used exclusively by many of the largest Rail Roads in this country and abroad, and more have been sold during the past few years than of any other make.

Make a trial, samples free.

**The National Lock Washer Co.,**

Hermon & Johnson Sts., NEWARK, N. J.